



FRIDAY, FEBRUARY 14, 1902.

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Contributions

Purdue's "Camel-Back" Engine.

Purdue University,
Lafayette, Ind., Feb. 3, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Supplementing the communication of Mr. J. Snowden Bell, with reference to Purdue's "camel-back" engine, which appears in your issue of Jan. 31, I submit here-with a letter recently received from Mr. W. S. G. Baker, President and Treasurer of the Baltimore Car Wheel Company. The statements of Mr. Baker are not only interesting in themselves, but are in full agreement with those of Mr. Bell.

The drawing to which Mr. Baker refers is colored, lined with India ink, and afterwards cut to the form of the engine. It constitutes, therefore, a plain card figure of the machine represented. This has been mounted and suitably framed and will henceforth be preserved in the Purdue locomotive museum. It is worthy of note that Mr. Baker regards the Purdue engine as representative of the first group of 10-wheel engines ever built. The letter of Mr. Baker is as follows:

"I have read with interest an account of the engine deposited with your University by the B. & O. R. R. as 'A Ross Winans Camel Back.' The description is that of a type of engine designed by Mr. Samuel J. Hayes, Master of Machinery B. & O. R. R., in 1853, being the first 10-wheel engines ever built; Mr. Winans did not approve of them, the Winans engine being eight wheels connected, was claimed to be injurious to the track, particularly on curves.

"There was a controversy between the Railroad Company and Mr. Winans, and Mr. Winans fitted up a curve with the rails seated on ties hanging upon links, that the pressure in curving might be measured at each tie; upon this curve the camel back and 10-wheel engines were tested. The 10-wheel engines were designed for passenger service upon 17-mile grade (116 ft. to mile) west of Piedmont, W. Va.

"Thinking it may interest you, I send you under separate cover original drawing of elevation made by writer, then an apprentice with the B. & O. R. R. doing work in draughting room. There were no injectors or steam gages in use, water was fed by two half-stroke pumps worked by crank from back driver, two spring balances were used; the valve gear was operated by hooks and an independent cut-off, which could be thrown out or in at pleasure of engineer.

"The engine described was of later date, a number having been built in the sixties for both B. & O. R. R. and Connellsburg R. R.; these engines used a stationary link, and at that time were considered models of good locomotive practice. Both types used chilled tires put on with taper and keys."

It is to be observed that both the communication of Mr. Bell and the letter of Mr. Baker are the result of a note entitled "Another Historic Locomotive for Purdue," which had its origin at Purdue, and which appeared in the *Railroad Gazette*, Jan. 24, 1902.

Referring especially to the spirit of criticism which prevails in Mr. Bell's article, I can not refrain from characterizing it as unnecessarily severe. The note to

which he objects specifically states that the Purdue engine is not an original Winans' engine; that the Winans' engines were eight-wheeled engines, while the Purdue engine is a 10-wheeler; but it does characterize the Purdue engine as a "camel back," and it credits Winans with having been the originator of the type. Mr. Bell's contention is that the Purdue engine is not a camel-back engine, though he admits that "it may be said to be of the 'camel' type, and that such engines are sometimes known as 'camel 10-wheelers,'" though "ordinarily and properly termed Hayes 10-wheelers."

I shall not undertake to prove that the Purdue engine is properly referred to as a "camel-back," though I am impressed with the belief that there is much justice in such a classification. My present desire is to know the facts concerning the interesting and important relic which has been deposited with us.

I should add that the imperfect sketch to which reference has been made, was sent out by us as a news item at the time the engine was received, and that immediately thereafter steps were taken to secure a record of the important facts with reference to the development of the particular engine entrusted to our keeping, which should be complete and satisfactory. As aids in advancing this research the article by Mr. Bell, the letter from Mr. Baker, which has been quoted, and other letters from Mr. M. N. Forney, Mr. J. N. Barr and Mr. O. B. Cromwell have been most interesting and very welcome to those who have the matter in hand. W. F. M. GOSS.

A New York Central Defect.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Since you have so fully, and so judicially, as it seems to me, treated the questions developed by the late tunnel accident, and so well defended some of its departments, will you please consider the larger questions of organization and management? This involves the attitude of the directors of the road toward the technical departments, and also their idea of service and promotion for merit, as is shown by the announcement just made by the Executive Committee to the following effect: "Mr. _____ has been elected Vice-President and General Manager. He will have direct charge of the Transportation, Engineering, Equipment and Purchasing departments." This is not a promotion of an officer of either one of these highly scientific departments. Mr. _____ is a most able and admirable man, but he is called in from another road and placed in complete control of three departments in which he has not had detailed experience and for which he had no preliminary training in a technical school. He has no detailed and professional knowledge of permanent way, bridges, buildings, block signals, interlocking, electricity, the properties of steam, locomotive proportion, car construction, chemical or physical testing laboratories, or of any details of the operations of which he has "direct charge," except in the transportation department, where his skill in employing, discharging and disciplining men has a great value.

It may be said that an officer who has shown orderly qualities as a clerk, reliability as a telegrapher and train despatcher and capacity to handle men as a general superintendent has acquired the ability to control departments of whose detail work he is ignorant. He can "hire skill" and judge of the efficiency by the results. Assuming that, by the use of horse sense and sound judgment, he can so check results, he, nevertheless, cannot check methods. His knowledge, coming from results, comes too late. He becomes a student of landslides, collisions and undue expenses already incurred. He cannot safely weigh the accomplishments of the able men in the motive power and engineering departments and promote them for merit, for he knows little of their methods, and with the timidity of ignorance he must and does choose for heads of these departments, when vacancies occur, men of apparently proved efficiency in like positions on other roads. It is difficult to measure the evil results, the disloyalty encouraged and the depressing effect on every meritorious officer and employee in his staff of one such appointment "from the outside." Repeated discouragements of this sort drive from the company's service every able, promising man who can get employment elsewhere.

The ability to discipline and control men is an inborn quality that the few possess and which is developed in service on the road, but the ability to oversee, guide and fairly criticise the engineering departments, to secure safety, speed, comfort and economy requires preliminary technical education. A great railroad is now the most complicated machine on earth. A battleship with triple-expansion engines, heavy guns, machine guns, range finders, searchlights and motors is as a candle to an electric-lighting plant when compared to a modern transportation machine. The man in direct control needs to have learned beforehand to read drawings, to learn from them rather than from wrecks and to have stored information of the "art and science by which the mechanical properties of matter are made useful to man in structures and machines." Of these subjects he can learn nothing in the train despatcher's office where no part of the road, its structures or equipment, are necessarily in sight; or in the traffic department, which is a commercial office for the sale of transportation as a commodity, where an ordinary passenger is a rival in opportunity for gaining knowledge of the physical characteristics of the road.

Safe and successful operation depends largely, mostly, on the efficiency of the division superintendents on roads

where these officers have charge of maintenance as well as of train loading and movement. The measure of their possible value is their thorough knowledge of these implements and their skill as bosses. They should be educated engineers, graduated from the engineering department on their own road, preferably from their own division, men who have developed power as organizers and disciplinarians.

Comparisons are frequently odious, and in the following comparison it is its value that makes it odious. On the Pennsylvania Railroad, the president and two of the vice-presidents are trained engineers, as is also the general manager and four out of five of the general superintendents, and most of the twenty division superintendents. Of the small minority of the general officers who are not technically civil or mechanical engineers, a considerable proportion have had training in those departments. The result of this full knowledge by all heads of departments of the company's physical properties and of the laws which govern the forces of nature is shown in the permanency of its works, the quality of its service, and the serious earnestness of purpose and loyalty of the members of its staff.

On the New York Central the scientific man does not belong. Not a member of its board of directors, not a general officer, except of the engineering departments, is an engineer, and surprisingly few among them are educated men. It may be in some specific cases unjust to say what is generally true of those in control of the operation of this great, this delicate and complicated transportation machine—their positions are valued for their power and for their money return only. There is no pride in accomplishment; no zeal, loyalty or hope for advancement by merit. The few earnest, scientific men have no support and are surrounded by an atmosphere of guessing. The spirit of a corporation starts at the top and reaches to the gravel train crew. Headquarters' clerks and private secretaries are whimsically put in control of structures and machines of which they know little more than the names and purposes; the deadly accidents occur; the directors cower and flinch before public execration until the storm blows past and they can again give serious attention to funding operations, new issues and the defence of damage suits.

It is easy to criticize. If this criticism is in any respect unfair the writer is sincerely sorry for it. The directors have not been niggardly; rather, their expenditures have been lavish, but they are responsible for the undeniable ignorance of the officers in charge of Conduct of Transportation, which is the real cause of the disasters that have occurred and of the continuing dangers and certain accidents and losses which will surely come so long as childish pride in speed records, enjoyment of power and greed are the impulses substituted for respect for knowledge and pride in good work.

SOLON.

The Ton-Mile in India.*

Managers of Indian railroads will fully understand how it is that English companies with their constant increases of capital expenditure, in working expenses and in the ratio of expenses to receipts, and in demands made on them for reduction of rates, are beginning to find themselves on the edge of a precipice, with the greater part at least of the dividends on their ordinary stocks in jeopardy. But they might also say that the discovery of the value of ton and passenger mileage returns comes more than a little late, and that to speak of it as an American practice implies a curious ignorance that the practice was adopted more than 30 years ago under the orders of the Government of India by all Indian railroads, and its results for at least 25 years have been widely disseminated in innumerable copies of Indian half-yearly reports, many of which must, at some time or other, have been in the hands of the bulk of the managers and directors of English railroads, if only because many of them hold Indian railroad stocks.

The present seems therefore a suitable occasion for stating the reasons which led to the adoption of these returns in India, and the results which have followed their introduction. I shall confine myself on this subject to the East Indian Railway, which took and has kept the lead in the matter from the first.

In the year 1867, 13 years after the opening of the line, the board of East Indian Railway found themselves in a very serious condition. Their capital expenditure had long passed all expectations, demands for fresh and heavy expenditure were reaching them almost by every mail, their working expenses were high, and their traffic was disappointingly small. It was felt that something must be done, and it was finally determined to despatch the gentleman who was then, and still is, their consulting engineer—Mr. as he was then, now Sir Alexander Rendel—to India to consult with the company's officers there generally on the subject.

I was then Secretary of the Public Works Department of India, and naturally I saw a great deal of Mr. Rendel. Of the result of his visit in respect to capital expenditure I need say nothing here except that it was highly successful. But by far the more important result, for, in fact, the usefulness of the line to India, as well as its financial success has been determined by it, was that our many conversations on the subject led to this

*Notes by Lieut.-Gen. Sir Richard Strachey, R. E., G. C. S. I. Reprinted from *Transport*.

conclusion—that nothing of value could be effected on Indian lines until their traffics were stated in ton and passenger mileage. That decision was come to in the early part of 1868.

It has become the established practice to place, week by week, before the official meeting, at which are present the agent and heads of departments, including the chief auditor, as well as the Government consulting engineer and examiner of accounts, a statement containing the principal results of the working, so that the whole of the officers concerned in the management of the traffic are kept continually informed of the progress made, and immediate attention is directed to any falling off or improvement in the train and wagon loads, as well as to the increases and decreases of the traffic of all description and the receipts from it.

The practical results of this system, the influence of which, on the administrative staff extends also to the board of directors, to whom these weekly statements are regularly submitted, may be gathered from the annexed comparison of the traffic of the line for the first half of 1872, before the new statistics had produced much, though still some result, with that of the first half of 1901—when they have been acted on for more than 30 years. I take for the former period what was then known as the main line. I omit the Jubbulpore line, the accounts of which were at that time stated separately, because it was then but new, and its union with the main line would lead to unduly unfavorable conclusions. I convert also rupees from their standard value in 1872 of 1s. 10d, to their present value of 1s. 4d., and I take a passenger train-mile in both cases as costing the same as a goods train-mile, and compute the cost per train-mile in the same way as in 1872.

We have then the following:

Passenger Traffic.—Miles open, 1,281 in 1872, as against 2,136 in 1901; average receipts from each passenger train per mile, 5s. 13d., as against 4s. 8d.; average sum received for carrying a passenger (taking

the latter nearly 250 per cent., while the mileage worked has increased more than 50 per cent.

(2). The increased train load of goods, which has been nearly doubled.

(3). The reduced charge for goods, the average now being considerably less than one-half that of 1872.

(4). The reduction in the cost of running trains, amounting to about one-fourth.

Under the influence of steady attention to train load we first largely reduced the mileage cost of carrying a passenger or a ton of goods. Then, having reduced our expenses we were enabled to reduce our rates; and then, by reducing our rates, we increased our traffic. We also saved in capital expenditure by reducing the quantity of rolling and locomotive stocks, and of station accommodation of all kinds, etc., that was needed to meet the requirements of the traffic.

The very different conditions of the two countries does not admit of any useful comparison of the money receipts and charges between the East Indian and North-Eastern railroads. As to train loads, however, it may be remarked that the passenger train loads, though four times those of the North-Eastern, are less than on several other Indian lines. The cause lies in our rates, which are still too high. In goods, although we have nearly doubled our train loads since 1872, the goods and mineral train loads should be greater than they are, and I have no doubt that a judicious reduction of rates would lead to an increase in quantities carried that would be profitable. There are, however, difficulties in the way of making provision for any considerable increase to traffic, whether in passengers or goods, that render any immediate action in this direction impracticable.

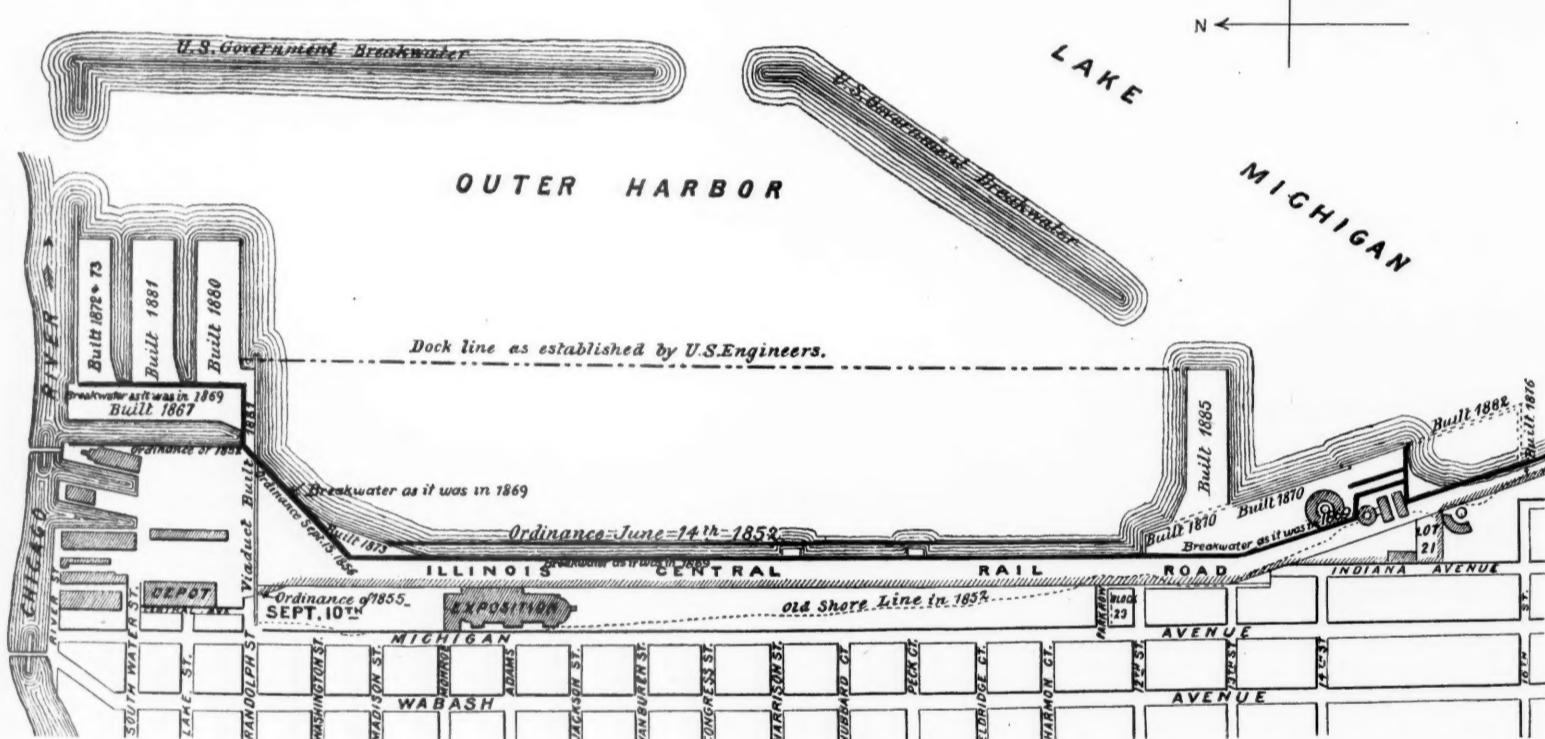
If it be asked what have ton and passenger mileage returns to do with all this, the reply is, that with ton and passenger mile returns, as well as passenger and goods train-miles, you arrive at once at the average passenger and goods train loads, and these are a test of the healthy management of a line such as a healthy pulse

Illinois Central Railroad Wins the Lake-Front Case.

On Feb. 3, Justice Harlan, of the United States Supreme Court, handed down a decision in the Chicago lake-front case, affirming the decisions of the lower courts, whose findings were in favor of the Illinois Central. By this decree the right of the railroad company to all of its wharves, freight yards, piers and slips on the lake front, north of Randolph street, and to similar property between Twelfth and Sixteenth streets on the South Side, in the vicinity of its roundhouse and main passenger station, is upheld. The value of the property involved is variously estimated as between \$3,000,000 and \$10,000,000, the latter figure probably being based on real estate values in that portion of the city contiguous to the disputed holdings.

The decision ends a suit of nineteen years standing, it having been begun by the Attorney General of the State in the Circuit Court of Cook County in 1883, and developed into one of the most famous lawsuits in the history of the State of Illinois. A brief history of the litigation is interesting, as well as being necessary to a proper understanding of the case.

In 1850 an Act of Congress granted to the State of Illinois the right of way not exceeding 200 ft. in width, for building a railroad between certain specified points. This Act was formally accepted by the Legislature of the State in the early part of 1851 and the Illinois Central Railroad Company was incorporated. In the charter granted to the company, a section provided that nothing contained in the Act should authorize the corporation to make a location of its track within any city without the consent of the Common Council of said city. The consent of the Common Council of Chicago for the location of the railroad within the city was granted by an ordinance passed in 1852, defining the location and limits of the right of way and granting certain lands for a depot, terminals, etc. The width of right of way granted was



Map of Property at Chicago Involved in the Recent Suit of the Illinois Central Railroad.

all classes together) one mile, 27d., as against .223d.; average number in any passenger train at any one time, 235, as against 257; average cost of running a train one mile, 2s. 3½d., as against 1s. 10½d.; average cost of carrying a passenger one mile, .112d., as against .088d.; average profit on each passenger per mile, .158d., as against .135d.; average number of passenger trains running over each mile of line each way per diem (supposing all trains to run over the whole line in operation), 2.25, as against 3.91; average number of passengers passing over each mile of line both ways per diem, 1,064, as against 2,010.

Goods Traffic (including minerals).—Average receipts from each goods train per mile, 7s. 6d. in 1872, as against 6s. 4d. in 1901; average sum received for carrying one ton of goods (taking all classes together) one mile, .789d., as against .377d.; average load in tons in any goods train at any one time, 113.75, as against 201.50; average cost of running a train one mile, 2s. 3½d., as against 1s. 10½d.; average cost of carrying a ton of goods one mile, .238d., as against .112d., average profit on each ton per mile, .551d., as against .265d.; average number of goods trains running over each mile of line, each way per diem (supposing all trains to run over the whole line in operation), 3.68, as against 7; average number of tons passing over each mile of line both ways per diem, 823.5, as against 2,820.

The main features of this comparison are:

(1). The great increase of the average daily number of passengers and tons of goods passing over each line of railroad, being for the former 100 per cent., and for

is to the human being. Making, of course, due allowance for variation of circumstances they are infallible. Low train loads, except under known or easily ascertainable circumstances, point, without doubt, to faulty management. If uncorrected, they will lead a line to destruction, for low train loads mean high train mileage.

The working expenses of a railroad are not necessarily proportionate to the traffic carried, but to the effort made to carry the traffic—that is, mainly to the train mileage run; and a needlessly high train-mileage means capital and revenue wasted in every possible form, and, worse than this, it means rates and fares beyond the necessities of the case and consequent needless burdens on commerce. The public always pays ultimately for the blunders of railroad management.

We who are connected with India are free, at any rate to a great extent, from this reproach, but this is due, in a degree which possibly will never be fully admitted, to our ton and passenger mileage returns, and the way they have been forced by the administrations on the attention of the executives of Indian railroads.

The Russian government is to begin work immediately on the proposed long railroad from St. Petersburg directly east, passing north of Moscow, avowedly to give employment and subsistence to peasants of districts where the crops failed last summer. The work, which will be done this winter, is the cutting out of line through the forests, which is expected to give work to 4,000 men. They are to be fed and paid \$4.12 per month.

300 ft., and its location between Twelfth street and Madison street is shown on the accompanying map, being between the indicated western boundary of the railroad's property and the heavy line off shore, marked "Ordinance June 14, 1852." It will also be seen that at that time this property was entirely submerged, the old shore line in 1852 being indicated. Over this portion of its right of way the railroad was built upon a pile-bridge, and a breakwater was built outside of its tracks for protection against the waters of the lake. The space inside the breakwater belonging to the railroad was gradually filled by the company.

In 1869 the Legislature of Illinois passed the celebrated Lake Front Act, by which the right and title, in and to all of the submerged lands constituting the bed of Lake Michigan, and lying east of its tracks and breakwater, for a distance of one mile, was granted to the Illinois Central Railroad Company.

Immediately after the passage of this Act the railroad prepared plans for the construction of extensive works in the way of piers, wharves, etc., along the water front, but the plan, as a whole, did not meet with the approval of the Government, and only a small part of it was carried into effect.

In 1873 the Legislature repealed the Act of 1869, but the railroad company did not assent to the repealing Act, and the improvements, begun upon the granted lands before the repeal, and not then completed, were continued to completion. Also between the date of the repealing Act and the commencement of the suit new works of considerable magnitude were undertaken and finished. These various

works, with the years in which they were built, appear upon the map.

In 1883 suit was begun by the Attorney General of the State in the Circuit Court of Cook County, the object of which was, in brief, to dispossess the railroad company of everything but its mere right of way. The case passed to the United States Circuit Court and in 1888 a decision was rendered, which, in effect, granted to the railroad company what it already possessed, but enjoined it from appropriating any more land. An appeal was taken to the Supreme Court of the United States by the railroad company. Shortly after the State and city, which were joint plaintiffs in the suit, also took appeals, and the City of Chicago succeeded in getting an opinion awarding the fee of all the land along the water front between Randolph street and Park Row and restricting the railroad company to a right of way 200 ft. wide, the court holding that it had elected to appropriate that amount out of the original grant of 300 ft. and could not, without further license from proper public authority, elect to appropriate a greater width. This separated the city from the case and left the dispute over the land north of Randolph street and south of Park Row.

In 1893 a decree was rendered by the Supreme Court affirming the decision of the Circuit Court, with certain slight modifications, and remanding the case for further investigation. This investigation had for its object the determination as to whether or not the piers erected by the railroad company extended into the lake "beyond the point of practical navigation, having reference to the manner in which commerce in vessels is conducted on the Lake."

In 1896 the Circuit Court declared that these piers did not extend into navigable water, and the title of the railroad company was therefore affirmed. From this decision the State appealed, first to the Court of Appeals and then to the Supreme Court of the United States. The decision now handed down settles the case finally, the nature of the award having been referred to in the beginning of this article. In its finding the court revived and laid stress upon the perpetual injunction, which prevents the railroad company from making any further inroads upon the water of the lake.

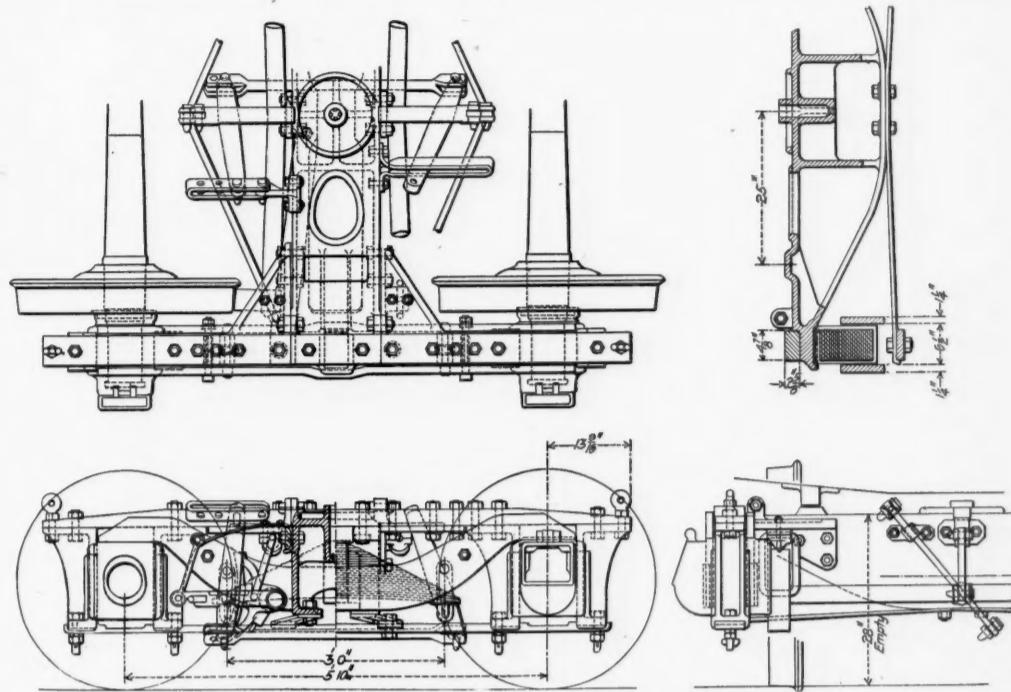
Steel Tenders—Pennsylvania Railroad.

The engravings show the type of steel tender and tank that is now in use on the Pennsylvania Railroad in connection with the locomotives running in fast passenger service. The tank has a capacity of 5,500 gals. and is built with a sloping back to the coal space as indicated in the engraving. The left-hand water-leg contains the compartment in which the vacuum pump for the steam-heating system is placed. There is no particular novelty in the construction of this tank other than the form of the hood over the water scoop. The sides are stayed by flat-iron set on edge and twisted at the ends with a jaw to take hold of the angle iron stiffener.

U section at the center and is riveted to gusset plates uniting the sills to the bolsters and end sills.

The intermediate cross-bracing extends across the frame and consists of two X frames of flat steel. The truck in use under this tender has a heavy side framing,

All such cases are presented to the commissioner for settlement, backed up by more or less public influence; and he must carefully sort them out, approving the meritorious ones, and denying the unreasonable ones. In almost every instance where such a request is denied,



Pennsylvania Railroad Standard Pedestal Type Tender Truck.

measuring $4\frac{1}{2}$ in. x $2\frac{1}{2}$ in. at the center, and tapering down to a thickness of 1 in. at the ends. To this frame the pedestals are bolted and these, in turn, are braced by a $6\frac{1}{2}$ in. x $1\frac{1}{4}$ -in. tie. The springs are suspended from equalizers set on the journal boxes, and carry the steel bolster, as shown in the cross-section, which is also bolted direct to the top member of the frame, and is stayed to the pedestal tie-bar by two flat bars. The axle used is what is known as the No. 7 of the Pennsylvania standards, having $5\frac{1}{2}$ -in. x 10-in. journals. These tenders are used in connection with the E-2 engines, various details of which have already appeared in these columns.

Protection at Highway and Street Crossings of Railroads.

One of the most embarrassing questions presenting itself for solution to railroad commissioners in those States in which the police power of the commissioner includes jurisdiction over the protection of highway and street crossings, is to make a just and satisfactory dis-

tribution charged with being controlled by the railroad companies. There is no one question in which the municipal authorities and the public generally are so unreasonable in their dealings with railroad companies, and in some States it is the source of great expense to the railroads.

In many instances, the increased danger is caused more by greater travel on the highway than by increased traffic on the railroad, so that there is no corresponding increase in revenue to the railroad company, but the railroad company is expected nevertheless to furnish the desired protection at its own expense.

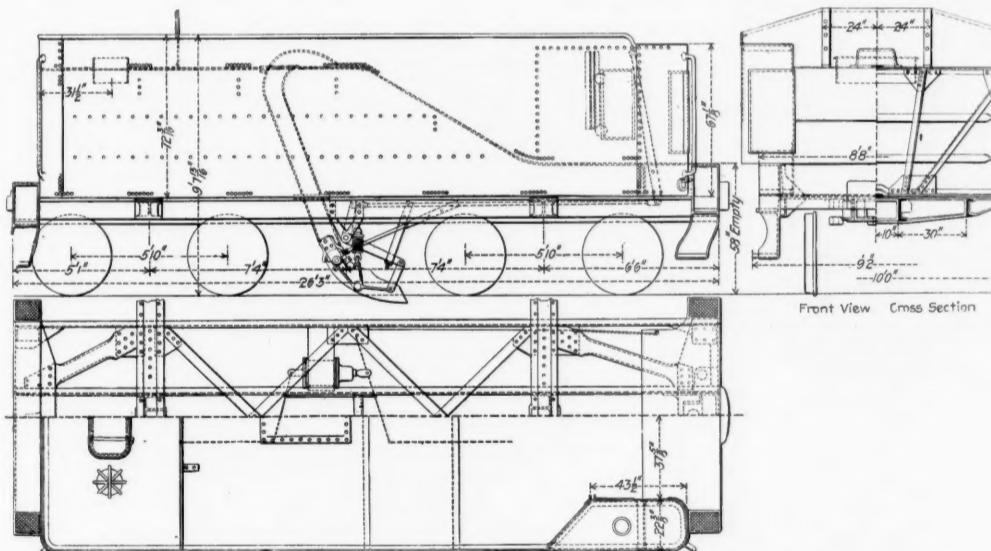
It looks, also; as though people, instead of growing more careful at crossings of this nature, are getting more careless, neglecting oftentimes to exercise even ordinary discretion under dangerous conditions. A short time ago, a man and wife were driving along the street in a little city in Michigan, where the railroad company maintains a flagman at the crossing, and, although warned by the flagman of the approach of a train, the man persisted in driving on to the crossing, nearly running over the flagman in doing so; and both he and his wife were killed. At the next meeting of the common council of the city, the railroad commissioner was requested to order gates at the crossing, or some other device that would make it impossible for a person to get on the track when a train was approaching, even if he desired to do so; in other words, to protect men positively against their own foolishness.

Unreasonable as this request appears, it is not an unusual one. Justice would seem to demand the enactment of legislation, providing severe penalties for approaching a railroad crossing carelessly. Where protection is found to be necessary, the law should provide that the expense of such protection be divided on a fair basis, between the railroad companies and the municipalities. By this means the municipal authorities might be led to consider the question more carefully and from a more rational standpoint; and the general public might be warned and educated to exercise greater care at crossings. Then the railroad companies would be relieved from many unjust burdens, while fewer lives would be sacrificed.

C. M. G.

A French Ten-Wheeler.

The Engineer (London), Jan. 24, describes an important six-coupled express locomotive (10-wheeler as we say) which was first used on the Eastern Railroad of France in 1898 for heavy passenger service, fast freight and similar work. It is a four-cylinder compound with crank axle, and the dimensions of the cylinders are $13\frac{1}{2}$ and $21\frac{1}{2}$ in. x $25\frac{1}{16}$ in. The working steam pressure is 201 lbs. per sq. in., and the valve gear is Walschaert for both the outside and inside cylinders; the gear for the inside cylinders being driven by eccentrics. The crank shaft is of the direct diagonal type, the cranks standing at right angles to each other and 162 deg. in advance of the pins of the high-pressure cranks outside. The receiver relief valve is set at $80\frac{1}{2}$ lbs. per sq. in., and at full boiler pressure the maximum effective pressure in high-pressure cylinders is 188 lbs. and in the receiver about 44 lbs. for passenger work. On freight trains the receiver pressure is sometimes run up to the full relief pressure of $80\frac{1}{2}$ lbs. per sq. in. The driving wheels are $68\frac{1}{2}$ in. in diam. with forged iron centers and cast-steel tires. The counter weights are designed to balance revolving masses on each axle and



Pennsylvania Railroad Steel Tender—5,500 Gallon Tank.

The turning forward of the delivery from the scoop is a change from the original arrangement, and serves to give a more quiet flow to the water than where it is turned back. With this the water has the full forward velocity of the engine before it leaves the conduit and therefore falls vertically into the tank.

The scoop is of the balanced type that has been a standard on the road for some time, and which was illustrated in the *Railroad Gazette* for Jan. 8, 1897.

The underframing is of steel with four channel sills. As shown in the cross-section the side sills are not set flush with the outer edge of the tank, but stand in about 18 in. from that edge. They are, however, about as far apart as the sills of the ordinary tender, being 6 ft. 8 in. between inside faces. The full width of the tank is 10 ft. The bracing of the underframing is such as to make it very stiff. The diagonal brace at the ends reaching from the end of the center sill to the union of the bolster with the outside sill is of pressed steel of

position of the numerous applications received for this kind of protection. In many cases aldermen, influenced by various sorts of motives, introduce resolutions in the common council to require the railroad companies to provide gates or watchmen at certain street crossings in the city, and such resolutions are always carried unanimously. It is always unpopular to vote against them, whatever may be the merits or demerits of the case. In some of the smaller cities and villages similar action is sometimes taken from a belief on the part of the municipal board that gates or flagmen at their street crossings will add a metropolitan appearance to their place, without expense to them. In the country districts, nothing more is required than that a few farmers make up their minds that it would be a nice idea to have a flagman at some country crossing. A petition asking for such protection is drawn up and circulated, and as it does not cost anything, it is signed by all to whom it is presented.

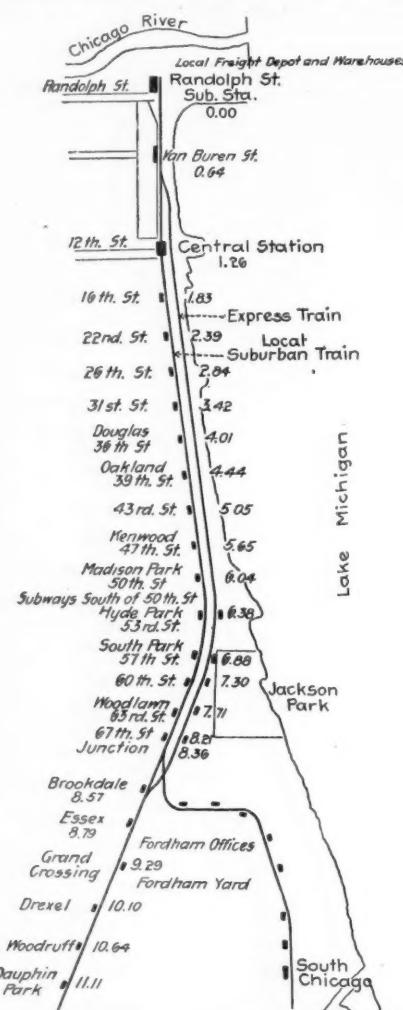
to equalize part of the alternating moments on the low-pressure crank axle.

To those who have made a close study of cylinder clearance volumes there will be something of interest in the statement that freer steaming of the engine at high speeds has been brought about by the use of very large clearance volumes in the cylinders. These volumes in per cent. of the piston stroke are given as, high pressure front, 18.7; back, 17.8; low pressure, front, 13.8; back, 11.2. The valve gear is so arranged that in case of accident, or at will, the high-pressure cylinders can be operated independently of the low pressure. The grate area is 27 sq. ft.; the total heating surface is 2,209 sq. ft., and the fire-box is copper.

These engines regularly haul trains weighing from 180 to 200 tons and occasionally as heavy as 300 tons. With a medium load on the level they can make 60 miles an hour and they have pulled trains of over 300 gross tons behind the tender at 40.5 miles on an opposing grade of 0.6 per cent., this being toward the end of the 160-mile run from Paris to Chaumont. The maximum effort at the drawbar, as obtained from indicator cards, is 7,040 lbs., and the coal consumed during the trial at which this record was made was .197 lbs. per ton-mile.

Illinois Central Suburban Electric Light Station.

The Illinois Central Railroad has in operation at Twenty-sixth street, Chicago, a three-phase system lighting plant designed to light all of the company's suburban stations from Randolph street to Dauphin Park, the main passenger station at Twelfth street, the South Water street local freight depot, the Wisconsin Central freight depot, as well as the yards in the vicinity of the power house and those at Fordham. As will be seen from the map shown herewith there are 22 suburban stations, the distance covered being about 11 miles, the



Electric Lighting of Illinois Central Suburban Stations.

South Chicago branch not being included. The capacity of the plant is equivalent to 20,000 16 candle power incandescent lamps.

The station equipment is housed in an addition built on to the machine shop at the Twenty-sixth street roundhouse and consists of two 300-k.w. and one 100-k.w. General Electric three-phase compensator type, revolving-field, 6,000-volt generators direct-connected to Ideal railroad type, four-valve, tandem-compound condensing engines, each of which is independently provided with a Baragwaneth siphon condenser. The engine of the smaller unit is 12 and 21 x 15-in. and is rated at 180 h.p. at 257 r.p.m.; the large engines are 19 and 34 x 18-in., being 480 h.p. at 200 r.p.m.

An interesting feature in connection with the boiler plant is the equipment of a portion of the battery with the Schwartzkopf coal dust firing apparatus, which has been applied in the past year. This apparatus automatically feeds the fuel to the furnace in a form as fine as flour, being specially ground for the purpose, and which produces an intense heat with low grades of coal.

The generators are connected in parallel and feed

into two three-wire lines, one of which runs north and the other south from the power house, the north line extending to Randolph street, and the south line to Dauphin Park. The heavy load is carried by the line north of the power house, which is entirely underground, being run in a single duct, cement pipe, conduit. The line consists of three No. 6 wires, in a single lead sheathing, as far as the main passenger station at Twelfth street, and north of this a No. 10 cable of the same description is used.

At the Twelfth street station there is a second switchboard and three 60-k.w. transformers which feed a secondary system at 110 volt for lighting the station. This system replaces a direct current plant which is retained as an auxiliary to the new arrangement. The station is amply provided with light, having about 4,000 incandescent lamps in the building and 60 Westinghouse enclosed incandescent arcs in the train shed, giving what the company believes to be one of the best-lighted train sheds in the country. In addition to lighting the building, power is furnished for the telegraph department by means of a rotary transformer and a storage battery plant. The line north of the passenger station lights the Van Buren and Randolph street suburban stations, the Wisconsin Central and South Water street freight houses and the group of buildings connected with the latter. There is also some electric heating done in the Wisconsin Central freight house. The line south is a pole line, and for part of the distance use is made of the poles of the Commonwealth Electric Co. It takes care of all suburban stations as far as Dauphin Park and the yards at Fordham.

On the underground line the transformers are placed in vaults, entered through manholes, and on all transformers the engineers adopted the practice of grounding the secondary, thus reducing the liability of danger to persons and equipment in case of a short circuit with the primary. The transformers vary in power from 1½ to 60 k.w. and are of the Packard core type. At the power house, main passenger and Van Buren street stations and South Water street freight house three transformers are used, one for each phase, to enable equalization of the load. Further regulation is obtained at the main passenger station through the use of throw-over switches, by means of which a portion of the load may be thrown from one phase to another. The stations other than those mentioned have single transformers.

The five-panel marble switchboard at the power house was supplied by the General Electric Co. Three of the panels are for control of the machines, the remaining two being feeder panels. In addition to the usual apparatus the board is supplied with recording wattmeters.

The installation of the plant was in charge of the Chief Engineer, Mr. W. J. Harrahan. The electric apparatus was installed by C. G. Armstrong & Co., Chicago, to whom we are indebted for the accompanying map, and much of the information given. The wiring material was furnished and the underground wiring was done by Kohler Bros., Chicago, and the overhead work, including the erection of the necessary poles, by the telegraph department of the railroad. The machinery department looked after the boiler and pipe work at the power house. The operation of the station is in charge of the telegraph department.

Test of Beaumont Fuel Oil.

A test of a horizontal return tubular boiler, fired with "buckwheat" anthracite coal and with Beaumont fuel oil, was recently made at a commercial plant in New York,

Dimensions of Boiler:

6 ft. diameter, 18 ft. long.
100 tubes $2\frac{1}{2}$ in. diameter, grate surface 45.5 sq. ft.

Duration, hours							
Horse-power							
Steam pressure (gage), lbs.							
Feed temperature, deg. F.							
Chimney temperature, deg. F.							
Quality of steam							
Moisture in coal, per cent.							
Per cent. of ash							
Times fire was cleaned							
Coal per hour per sq. ft. of grate, lbs.							
Oil per hour per sq. ft. of heating surface, lbs.							
Dry steam per hour from and at 212 deg. per sq. ft. of heating surface, lbs.							
Heating surface per horse-power, sq. ft.							
Total dry steam per lb. of fuel as fired from and at 212 deg. lbs.							
Per cent. of steam used by burner*							
Net lbs. of dry steam per lb. of fuel as fired from and at 212 deg.							

*The steam used by the oil pump was a fraction of one-tenth of 1 per cent., and it is therefore not considered.

and the results were published in the *Engineering and Mining Journal*, Feb. 1. The table gives the boiler dimensions and some of the results obtained.

The Engineering Laboratory of the Stevens Institute.

On Thursday of last week took place the formal dedication of the Carnegie Laboratory of Engineering of the Stevens Institute of Technology. A large and distinguished company was gathered for the ceremony, which took place in the draughting room of the building. This building was the gift of Mr. Carnegie, and has been completed and in use a few months.

Perhaps the most interesting part of the ceremony was the characteristic address by Mr. Carnegie. He said that he believed that his company was the first American iron and steel firm that ever thought it worth while to employ

a chemist, and that chemist was imported from Germany at the salary of \$1,500 a year. Although Mr. Carnegie's rivals laughed at him for employing a chemist, one result was that he soon learned to get better ore and cheaper ore than his rivals. "Other manufacturers were buying ore by name; we got the richer and cheaper ore which had no name. We made money by looking beneath the name." He spoke of a famous English iron master who not long ago said to him: "Mr. Carnegie, it is not your superior ores, nor your great mills that impressed me most, but the class of young men you have in the iron industry here. We have no corresponding class in England."

The alumni of the Institute afterward gave to Mr. Carnegie a section of the first T-rail ever rolled, which was made in 1830 by Sir John Guest, in Wales, after the designs of Robert L. Stevens and under his supervision. This souvenir was in a silver box, which bore medallions of Mr. Carnegie and Mr. Stevens. Mr. Carnegie said: "I never thought that my name would ever be put on the same thing as Robert Stevens's. He was original if ever there was an original man, while I cannot lay claim to that." Mr. Carnegie said that he should choose for his epitaph: "Here lies a man who knew how to use cleverer men than himself."

On Monday of this week public announcement was made of the fact that Mr. Carnegie had sent to President Morton, of the Stevens Institute, a check for \$100,000. The assumption is that this will be used towards the maintenance of the Engineering Laboratory, but no conditions were attached to the gift.

Handling Less Car Load Tonnage.*

BY EDWIN H. LEA.

The large loss to a railroad company through the payment of loss and damage claims originating from irregularities in checking, loading, unloading and delivery of L. C. L. tonnage, makes it incumbent upon all interested in, and responsible for, the interest of a company in this direction, to put forth systematic efforts to reduce to a minimum this drain by the inauguration of methods that will tend to eliminate to a great extent the causes of the irregularities now existing. My experience in handling freight convinces me that the present conditions are largely attributable to the following causes, some of which can be overcome to a great extent:

1. The inefficiency of those directly responsible.
2. The insufficiency of force allowed.
3. The deficiency of systematic methods.
4. Difficulty in securing competent employees.
5. Lack of care and good judgment on the part of local train and yard crews.

1. Inefficiency of Those Directly Responsible.—It must be conceded that herein lies the cause for a large percentage of the irregularities, for which agents are largely held by their respective companies as directly responsible. It is, therefore, incumbent upon each to improve the work of his subordinates, and by personal effort to raise it to the highest standard possible, under the conditions existing at their respective agencies. The following pertinent questions, conscientiously answered, will indicate to us all whether or not we are doing our full duty toward the company we represent:

- (a). Are we keeping an accurate weekly record of all classes of errors?
- (b). Are we daily inspecting our records of exceptions and corrections?
- (c). Do we devote so much of our personal time as is

	Beaumont Crude Oil.			No. 1 Buckwheat Coal.	
Nov. 27	Nov. 28-29	Nov. 28-29	Nov. 29	Dec. 1	Dec. 13
3.5	8	11	13	11	12
146.9	112.7	189.7	138.0	220.1	92.6
87	86	86	86	86.5	86.5
69	90	70	90	74	68
374	360	398	370	425	389
Dry.	Dry.	Dry.	Dry.	Dry.	Dry.
				6.2	6.2
				16.2	18.0
				Once	Twice
				7.66	10.10
				0.182	0.247
0.181	0.135	0.226	0.163	0.263
	2.73	3.52	2.56	4.08	2.21
	12.6	9.8	13.5	8.45	20.1
15.29	15.53	15.55	15.71	15.49	9.17
3.6	3.1	4.8	3.5	4.8
14.74	15.05	14.80	15.16	14.75	9.17
					8.94

*The steam used by the oil pump was a fraction of one-tenth of 1 per cent., and it is therefore not considered.

necessary to get at bottom facts as to prime cause in each case, so as to correctly charge every error?

- (d). Are we personally censuring or discharging those whose errors are above a reasonable average?

This error record enables an agent to locate the individuals doing the best work; and the painstaking careful worker receives his reward under this system. Inaugurate an error record and you will find surprising results.

- (2). Insufficiency of Those Employed.—Our first duty is to develop the force we are allowed into a well-trained, efficient body of workers, personally knowing what amount of work is required of each man. Base on the best man in each department, and require others to come up to that standard, taking into consideration salary paid. By this

*Read at a meeting of the Southern Railway Agents' Association. Mr. Lea is Freight Agent of the Southern Railway at Richmond.

method very close results can be arrived at, and you can readily satisfy yourself as to whether your force is or is not giving you maximum work. If, after a thorough personal test you find your men are efficient and working up to capacity, and you still are unable to handle your business satisfactorily, get facts and figures together in a clear and concise statement, and submit to your superior officer; it will receive due and satisfactory consideration.

When your request for additional force is approved, do not cease your personal efforts to watch daily the business you are doing. Keep your percentage of cost per ton within your average limit; post yourself daily; do not wait for the end of the month to make comparisons, but be in a position to regulate your force more quickly.

Keep yourself advised of business conditions generally in your city. In this way one can make close calculations as to expected tonnage, certainly a few days ahead, and your troubles will be largely reduced.

(3). Deficiency of Systematic Methods.—The lack of an effective loading system is a great drawback in the handling of miscellaneous tonnage; it is an absolute necessity. The cost to equip a station is nominal compared with the saving in time, expense and loss of freight. An agent who investigates his error list carefully soon discovers the causes for mistakes made at his station, and can apply some simple check or remedy in each case. When he has covered the majority of errors common in handling freight, he will find he has a system, which, if inaugurated on practical lines, will greatly improve his station work.

(4). Difficulty in Securing Competent Employees.—We very often find ourselves unable to secure an experienced man to fill an important position. . . . The equalization of salaries for similar work with those of other lines at the same point should have the consideration of our superiors, as experience is as necessary to one company as to another, dealing with this question from an agency standpoint.

I would suggest as a protection to himself that an agent give the matter of training young men in railroad work his personal attention. Select those of good character, who write well, and indicate a desire to become proficient in the work; test them in different departments, watch them personally; do not depend altogether on reports from other employees. The latter often discourage the young beginners by telling them of the thousand and one things that they will be required to know and to do, many of which will not require a test of his knowledge in a year's work. With a fair share of patience, you can train a bright young man within a short time to be very useful, and he will remain longer with you; the plan is worth a trial.

(5). Lack of Care and Good Judgment on the Part of Local Train and Yard Crews.—In these days of air-brakes, especially when trains are partially equipped, the shocks are more numerous; the yard handling is often rough. These, together with the improper leveling down of local cars by train crews, tend to destroy the good effects of careful loading, it being impossible to load a station order car without having one station's freight dependent on the other for support and protection; extra precaution must, therefore, be taken by all concerned for the freight's protection, and the yard and train crews must be held for their share of responsibility in the handling of this tonnage.

of whom will be found at every important junction in the kingdom. These number-takers are absolutely independent of the agents of the respective roads. Since the establishment of the Clearing House, records have been made of 18,626,931,374 car and engine miles, which does not include empty mileage. To travel this distance, at

Special Train for Prince Henry.

The Pullman Company will furnish the special train used by Prince Henry of Prussia while in this country. This train will consist of a composite smoking and baggage car, a dining car, three compartment cars, a 12-sec-



Dining and Observation Room of the Car "Olympia."

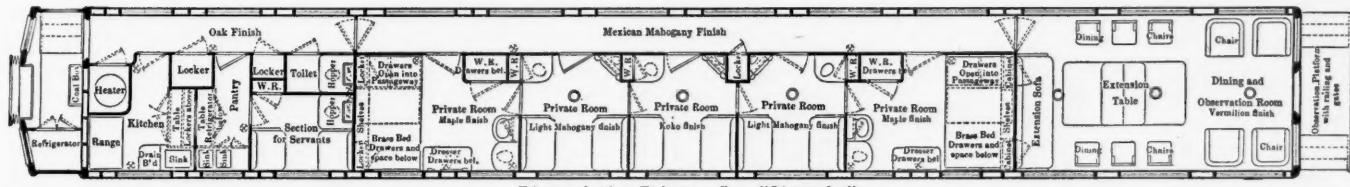
60 miles an hour, an express train would have to keep moving about 2,800 years.

The Clearing House not only keeps the mileage, but keeps a record of the days, and since its establishment it has rendered bills for demurrage amounting to 26 millions of days, which is eight times as many days as have elapsed since the creation of the world, according to the orthodox chronology.

The number-takers of the Clearing House keep records—besides the numbers of the cars and the dates, etc.—of the capacity of each car and, in many cases the class, as, for

tion sleeping car and the private car "Olympia," the last-named being for the personal accommodation of the Prince. The entire train will be lighted by electricity.

The accompanying engravings show a plan of this last-named car and interior views. The "Olympia" is 70 ft. long, has five private rooms and one sofa section, and is designed to accommodate nine people. The two large private rooms have each a large brass bed, with drawers below, and spaces for steamer trunks. All rooms have separate toilet rooms, large mirrors and wardrobes. The dining and observation room is 16 ft. long and has an



Plan of the Private Car "Olympia."

This question of handling L. C. L. tonnage properly is being constantly handled by our high officials for improvement, and the adoption of some more systematic methods that will insure better results. Official efforts in this direction can be largely augmented by the adoption of a line of duty on the part of agents at large originating or transfer points and other employees somewhat after that outlined in this article. An agent at a large terminal is paid for and expected to supervise the work at large at his agency, and it is his duty to become thoroughly familiar with the smallest detail connected therewith, exerting every possible personal effort towards advancing the interests of his company. . . .

Interchange of Freight Cars in England.

From an article on the Railway Clearing House, in the (London) *Railway News*, it appears that the railroads of the United Kingdom now own 696,000 freight cars, 48,000 passenger cars, 37,000 mail cars, cabooses, etc., and 21,000 locomotives, a total of 802,000 vehicles; and in the year 1900 the trains composed of these vehicles were run 402 millions of miles. We know of no record of car miles run in the United Kingdom, and it is stated in the same article that the Clearing House takes account only of the movements of cars and engines when they are away from the home road. The Clearing House employs over 400 clerks in the mileage department alone, and it has 500 number-takers, one or more

example, special cars run for carrying explosives. In the case of passenger cars the class is an important element of the record. The junction reports, which aggregate about 750,000 a year, are sent to the head office weekly. In recording the numbers of many of the cars, six figures have to be used. English freight cars now often travel 300 miles a day, an improvement, due to increasing competition, from a former mileage of 120 a day.

The manual for the guidance of the clerks in their computations has 17,000 stations and 1,250,000 items showing distances from one station to another. A strict account is kept of the time which cars are kept away from home. Two days free time is allowed, and after that the demurrage which accrues is charged by the Clearing House to the road holding the car, and credited to the owner. The rate of demurrage on ordinary freight cars is 3s a day, but on those of greater capacity the rate is made higher in proportion. For tarpaulins the rate is 6d for the first day, and 1s a day thereafter. The rate for a first-class passenger car is 10s a day, and for second and third class 6s. The account before us gives no information about the basis on which borrowed cars are paid for when there is no detention beyond the two days allowed free.

The high-speed experiments on the Berlin Military Railroad, suspended because the track needed improvement for still higher speeds, will not be renewed until spring.

extension table and two cabinets. This room is finished in vermilion; the private rooms in maple, mahogany and koko and the kitchen in English oak. The general arrangement is clearly shown by the plan.

Australian Railroads.*

Australia is about 2,500 miles long by 2,000 broad. Its climate is temperate in the south and tropical in the north. It produces wool, wheat, horses, cattle, sheep, dairy produce, sugar, coal, gold, and other metals; population, 3,800,000 at present, and is steadily increasing; divided into five states, which, with the adjoining island of Tasmania, are united to form the Commonwealth of Australia. A coast range runs round most of its perimeter. Outside this is a comparatively narrow strip of usually fertile country, with good rainfall and short, swift rivers, navigable only near their mouths. Inside is a vast shallow basin, with small rainfall, often arid surface, and long, tortuous rivers, precariously navigable, which in some cases ultimately reach the sea, but in many others lose themselves in swamps. This island basin is useful for pastoral purposes in the eastern portions, but in the western is a nearly valueless desert, which, however, has important towns in it at places where gold abounds.

*Abstract of a paper by Prof. W. C. Kerton read at the Glasgow Engineering Congress.

Railroad making commenced at Sydney and Melbourne, the two largest cities (now possessing about 500,000 inhabitants each), soon after 1850. Melbourne, together with some other parts, acting under advice, adopted the 5 ft. 3 in., or Irish, gage. Sydney, after having agreed to 5 ft. 3 in., went back to 4 ft. 8½ in. Queensland somewhat later adopted 3 ft. 6 in.; so did Tasmania and Western Australia. Thus a most unfortunate confusion of gages has come into existence. There are now 12,554 miles of State railroads in Australia, of which 3,725 are 5 ft. 3 in.; 2,811, 4 ft. 8½ in.; 5,970, 3 ft. 6 in.; and 48 miles, 2 ft. 6 in., as well as about 1,000 miles of private line, mostly 3 ft. 6 in.

In crossing the coast range and its spurs severe grades and high summit levels occur. The western line of New South Wales rises 3,300 ft. in 30 miles, requiring long continuous grades of 1 in 33, and in one case nearly two miles of 1 in 30. The northern line of Victoria rises 1,880 ft. in 42 miles, having long grades of 1 in 50. The line from Adelaide to Brisbane, via Melbourne and Sydney, crosses the coast range six times, and reaches a summit level of 4,473 ft. Of its total length of 1,783 miles, 134 are above 3,000, 409 above 2,000, and nearly 800 above 1,000 ft.—grades ascending and descending 1,000 ft. in 10 to 12 miles, and having inclinations of 1 in 50, 1 in 40, and even in one instance 1 in 30 occur.

Grades have in some cases been recently improved, but this cannot be done where they are continuous for many miles, as is the case at some of the most difficult parts.

In Victoria 40 chain curves are usual on main lines, but in New South Wales and South Australia curves as sharp as 12 and even 10 chains occur at mountainous parts. On the 3 ft. 6 in. gage 5 chain curves are usual.

The double-headed rail originally used has for many years been given up, and a steel rail of Vignoles pattern substituted. One hundred pounds per yard is standard for busy suburban; 80 for main lines; and 60 for branch lines are common on the wider gages.

Owing to severity of grades and character of traffic, power is required rather than speed; hence small wheels and coupling are general. The Victoria standard engines are four or six coupled, with inside cylinders. Those of New South Wales, four, six, or eight, coupled with outside cylinders and leading bogie. Six coupled engines of 56 tons, not including the tender, and indicating over 1,000 h.p., are used for express trains on the heavy grades. On the 3 ft. 6 in. lines outside cylinder engines, with small wheels, from six to eight coupled, are general. American engines are used to some extent, especially on sharp curves; but English, or locally made engines of English type, are usually preferred as being more economical in point of fuel consumption and repairs. The Westinghouse brake is general. One private line in Tasmania uses the left rack on a 1 in 16 grade, the gage being 3 ft. 6 in.

The Porto Rico Railways Co.

This company has obtained a franchise from the Island Government, approved by President Roosevelt, for a system of railroads on the Island of Porto Rico, extending from Aguadilla, on the Mona Passage at the west end of the Island, to Ensenada Honda at the east end,

water port now in use in this locality. The port is to be on Jobos Bay, which is well sheltered, with the exception of one small opening in the outer reef, which can be closed if desired, as the depth of water there does not exceed 12 ft. The depth of water within the bay is ample for ships of the greatest draught, which is not true either of Ponce or of San Juan; it is intended, therefore, that Port America, rather than San Juan, shall eventually be made the general port for deep sea traffic.

There is at present in operation on the Island a line from Camuy to San Juan and Carolina along the greater part of the north coast and also between Yauco and Ponce, and between Salinas and Jobos Bay on the south coast, with a branch on the west, known as the French Railroad, which is heavily subsidized by the government. The gage of the Port America road will be one meter, to correspond to that of this existing line.

The capital stock of the Port America company is \$250,000, of which somewhat above \$100,000 is paid up, and General Roy Stone is the chief stockholder. The Porto Rico Rys. Co. is being formed to take this company over, and build the road.

New York Railroad Commission Report on Tunnel Collision.

The Commissioners issued their full report on the Fourth Avenue tunnel collision, on Feb. 8. We condense by omitting some of the explanations which to railroad readers are unnecessary.

The best method of dealing with the tunnel itself would be to take off the roof and reopen it, as a cut. . . . From the public point of view this change is deemed intolerable. Electricity is the most desirable motive power for the tunnel, but legislation is necessary to relieve the railroad company of the present obligation that it shall use steam, and steam only.

The operation of the tunnel as a single signal block would be as safe, in this respect, as a tunnel can be made, but it would be impossible to transact the daily public business within the hours when the people who patronize the road require it to be done. The empty trains must be got rid of practically as fast as received at the station, either by running them out of the yard to Mott Haven or by storing them on the few sidings now available. It would be dangerous in the extreme, as well as difficult, to keep up a return movement of these light trains across the two main in-bound tracks.

It is not safe or advisable to light the tunnel in the sense of making a clear illumination in it. . . . There does not appear to be any feasible way of ventilating this tunnel. The most trustworthy civil engineers who have appeared before this Board say they regard ventilation, either by forced draught or by suction, as impracticable.

With respect to the causes of and responsibility for the collision, this Board finds and, therefore, declares:

(a.) That the engineer of the Harlem train was inexperienced; that he lacked reasonable presence of mind when he had lost or failed to see his signals, and that he unmistakably violated the well-known rule, which, under the conditions surrounding him, required him to stop his train.

prepared by this Board, and introduced, on its request, in both legislative houses, will confer the authority necessary for that purpose. The Act of the Legislature (1872) expressly limited the railroad company to the use of steam power. . . . The original tunnel, it may be here remarked, consisted of a rock bore of two city squares, from Ninety-fourth street to Ninety-sixth street. The whole of the tunnel as it now exists, from Ninety-fourth street south to Fifty-sixth street, is artificial, and was constructed by the railroad company and the city of New York jointly, under special legislative authority (1872), the city paying one-half of the cost and providing three out of the four members of the governing board.

The Board recommends:

(a.) That the signal in the tunnel, between Fifty-fifth and Fifty-eighth streets, be abolished on all four tracks, and its trackage added to the next northerly block, which extends to Seventy-second street on the inbound track, and to Seventy-third street on the outbound track. This change will give the new southernmost block section, which is now approximately 788 ft. long, a length of 4,419 ft. on the inbound tracks and 4,640 ft. on the outbound tracks. The middle block (Seventy-second to Eighty-sixth) is about 3,800 ft. long. The northern block (Eighty-sixth to Ninety-eighth) is now 3,219 ft. long on the inbound track, and on the outbound tracks, 2,598 ft.

(b.) That this block last referred to be lengthened by removing the signals and cross-overs [northward about 1,100 ft.]. This change will make this block 4,286 ft. in length on the inbound tracks, and 3,645 ft. on the outbound tracks. The Board is of the opinion that these last-mentioned signals and cross-overs are, for outbound trains, too close to the north end of the tunnel. The Board will watch the operation of the tunnel in three blocks with especial care, and if it results favorably will next give attention to the feasibility of adopting a two-block plan, which, if practicable as to time and the volume of traffic, will doubtless conduce to greater safety in operation. The fact will remain that all railroading is dangerous, and that only relative safety can be obtained by the best rules, devices, and discipline.

(c.) That all distant and home lamp signals on the firemen's side [that is, the wall side] in the center tunnel be placed on standards or spindles at a height of 9 ft. above the top of the rail, so that the lenses will be on a level with the cab window, and that in the side tunnels [with walls close to the track on both sides] the lamps be raised to a height of 9 ft. above the top of the rail on each side of the tunnel; also, that each home signal lamp be duplicated by placing an additional lamp of the same size and power 2 ft. above or 2 ft. below the 9-ft. light, as may be found most serviceable. The use of fresh soft coal in locomotive furnaces while passing through the tunnel has already been forbidden by this Board, and any firing or stoking hereafter done within the tunnel must be done only in emergency, and anthracite coal or coke only shall be used.

(d.) That temporary changes in the yard tracks, to be made on newly purchased property, be begun forthwith and completed without delay.

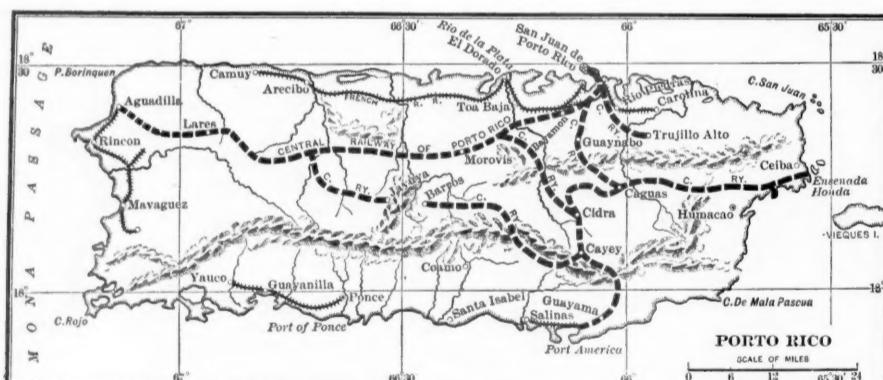
(e.) That the proposed underground suburban traffic loop be carried to completion with all diligence as soon as the necessary legislation is had.

The tunnel itself is not especially difficult for the operation of the trains, except as it is obstructed by steam and gases from combustion, and by occasional fogs, taken in connection with the immense volume of traffic. The railroad company has year by year during the past ten years felt the absolute necessity of escaping from its cramped environment at that terminal; yet, when it but recently made improvements in the Grand Central station in the line of comfort and elegance, it unwisely extended the station northerly some 70 ft., thus reducing by that amount the length of the tracks in the train-yard proper. This was, in the opinion of this Board, a step in the wrong direction.

The size and available shape of the yard is such that nearly all traffic going into or emerging from the tunnel, over its four tracks, must go over but two tracks for several hundred feet, in the yard between Fifty-fifth street and Forty-eighth street, and these two main-line tracks are crossed more or less frequently by practically every outgoing regular train or shop-train [empty-car train] or engine. This cramped condition as to yard room is the main source of the present troubles in operating the tunnel itself, because it necessitates the passing of nearly all of the regular trains back and forth, empty, between the station-yards and the shops and yards at Mott Haven, for cleaning and storage. Empty trains and light engines make up not less than 40 per cent. of the present daily movements in the tunnel. The 323 regularly scheduled trains could be managed with comparative ease if the yard room was ample. . . .

The loop tracks afford a solution of the problem of today, but unfortunately it cannot be carried out in much less than two years. The newly acquired surface area will give some relief, and the Board believes that this modicum of betterment should be accomplished within a few months.

. . . The Board has directed that trains be run at what it believes to be safer intervals of time and distance than formerly. . . . Signaling experts unite in declaring this tunnel to be the most perfectly equipped as to its signals in the world; but they at the same time declare that they know of no other tunnel so difficult of operation. In 1901 there were 177,450 trains moved through the tunnel, an average of over 486 per day. And it should be remembered that this movement takes place



Map of Porto Rico, Showing Railroads in Existence and Projected.
(The broken line indicates the projects of the Porto Rico Rys. Co.)

and from San Juan on the north to Port America on the south, with various branches, a total distance of about 300 miles. At present, however, it is proposed to build only what is known as the first division, from San Juan to Caguas, east of the center of the Island and south of San Juan, and thence eastward through the central valley of the Island, to the deep water harbor of Ensenada Honda, 52 miles, traversing a sugar district.

In accordance with the terms of the franchise, work must begin within 90 days from Nov. 26, 1901, and 50 miles must be finished within the first year, 75 miles the second, and the remainder of the projected 300 the third. Of the 52 miles of the first section, work will be easy, with light grades, and the cost has been estimated by the Elliott-Cornell Co. as \$773,679. The traffic in this part of the Island is at present handled by ox-teams on the military road between Caguas and San Juan, and is quite heavy.

The harbor of Port America, on the south side of the Island, to which the line is eventually to be built, is a separate project from the railroad, as there is no deep

(b.) That the New York Central & Hudson River Railroad Company was grossly negligent of its obligations to the public in putting an engineer of such limited experience and unascertained capacity in charge of a passenger train for operation through this tunnel in what are called the "rush hours."

(c.) That the New York Central & Hudson River Railroad Company has been negligent, derelict, and unprogressive in failing to take measures to increase its terminal facilities at the Grand Central Station and yard by such dimensions as would reasonably keep pace with the yearly increasing traffic necessities of the lines entering this station.

(d.) That the said railroad company has been negligent in failing to examine more closely into the qualifications of new engineers and lax in discipline in failing to hold engineers to accountability for violation of the running rules of this tunnel.

The present power of this Board, under the laws, is not sufficient to enable the Board to require a change from steam to any other motive power. But the bill already

—through public necessity—almost wholly between 7 o'clock a. m. and 9:30 p. m. The time is not many years distant when the increasing traffic of this triple railroad terminus will require enlarged and better facilities. . . . Here the Board suggests that if the New York Central's existing terminal facilities on the west side of the city, in the vicinity of Thirtieth and Thirty-fourth streets and the North River were used, the surface and elevated roads would quickly extend their connections so as to make that terminus easily accessible.

The Board has been asked to order a score of changes, of a minor character, as for example, the raising of the landing platforms in the station so that they may be level with the platforms of the coaches. This would be a convenience, but the vestibuled coaches are almost the only coaches fitted with the adjustable platform, covering the steps, and to require this change to be made in all of the ordinary coaches would be in effect altering them to suit the conditions of a single station.

Much has been said on the subject of steel-framed passenger coaches. There are no such cars in general use on any road, nor does the Board know of cars with steel sills in private use. Car builders say they would be so heavy as to be impracticable. They further declare that the body frame of the telescoped rear car of the New Haven train was of the same character as the body frame of a Pullman sleeper or drawing-room coach; and that it was in good condition.

In conclusion, the Board deems it proper to say that it will request the responsible companies to give close attention to details of signal and train equipment and operation, and to the discipline and efficient service of train crews during the period required for making all of the contemplated changes, whether temporary or permanent. These details will be communicated to the companies through special letters and upon personal inspection by the Board and its inspectors.

A Portable Accelerometer for Railroad Testing.*

BY F. B. COREY.

Various devices have from time to time been tried in order to secure direct readings of acceleration and retardation of moving cars and trains.

The instrument which I am about to describe seems to satisfy, in greater or less degree, the requirements, and although it has certain limitations, I believe it to be more generally satisfactory under the various conditions of practical testing than any instrument of the kind heretofore used.

The action of this instrument depends upon the inertia of a small mass of mercury contained in a horizontal passage, the ends of which are in communication with two short vertical columns of mercury. Thus, the flow induced in the horizontal passage produces a difference of level in the vertical columns, which difference of level is wholly dependent on the horizontal component of the acceleration in the plane which passes through the axes of the two vertical columns. Upon this difference of level, or rather, upon the change of level of either column from a given zero position, must depend upon the indication of the instrument. In a small instrument, however, such as might be conveniently carried in the pocket, this change of level is very small. For instance, assuming a distance of 4 in. between the centers of the mercury columns, the change of level would be less than $\frac{1}{2}$ in. for an acceleration of four miles per hour per second, which is about the maximum possible on steel rails. It is therefore evident that some method of multiplication must be used to secure a reading scale sufficiently extended for practical work. For this purpose, colored alcohol or other liquid of low specific gravity is introduced into the spaces above the mercury columns, to which spaces the reading tubes are connected. The reading tubes are of comparatively small diameter. Thus, the ratio of the cross-section of the mercury column to the cross-section of the reading tube becomes approximately the multiplier of the changes of mercury levels. The upper ends of the two reading tubes are connected together so as to prevent evaporation and spilling of the liquids. The reading scale is provided with vertical adjustment to facilitate the proper location of the zero point.

Since the acceleration of gravity (32.2 ft. per second, or 21.95 miles per hour per second) is produced by an accelerating force (resultant) of unity; that is, of 2,000 lbs. per ton, it is evident that acceleration may often be best expressed in effective pounds accelerating force per ton weight of car or train. Hence we have two separate scales for reading in either unit desired, each of which units is readily convertible into the other.

If we represent any given horizontal acceleration as a fractional part of the acceleration of gravity, as $g \div n$, the angle which the surface of any liquid thus accelerated will make with the horizontal is that whose tangent is $1 \div n$. Therefore, in the calibration of this instrument, we have only to lay out a series of angles whose tangents are, say, .05, .10, .15, and .20, and place the instrument at the corresponding inclinations to determine the points on the reading scale corresponding to the effective accelerating forces of 100, 200, 300, and 400 lbs. per ton respectively.

It is evident that if the accelerometer be set to the zero position when the car is either at rest or moving uniformly on either a level or gradient, the indications

will be accurate only so long as the car remains on track of constant grade. When the grade changes, the accelerometer must be readjusted or the proper correction made. Usually either a stop or a period of constant speed running gives opportunity to reset the instrument or determine the correction. When this cannot be done at the time of testing, the accelerometer should be set at zero on a level track, and the car run over the road and brought to rest on all grades to be measured. It is evident that used in this way the instrument becomes a gradiometer, giving an indication of 20 lbs. per ton for every 1 per cent. of grade.

I referred above to the desirability of an accelerometer by which continuous records could be made. In fact, without some such device, the accelerometer is useful only in measuring maximum and minimum values. The instrument described above has been mounted on a recording device. In this device the fluctuations of the instrument are followed by hand, the record being produced upon a continuous strip of coated paper which is caused to pass at uniform speed over a drum; the drum was driven by an ordinary phonograph motor. This method of producing record curves has been found to be entirely satisfactory.

There is, of course, an error in this instrument due to the difference in the ascending and descending meniscus surfaces. With columns of as large diameter as those used, however, this error would, under any circumstances, be small, and here it is almost entirely obviated by the slight but rapid vertical vibration of the moving car.

One of the most noticeable characteristics of this instrument is the accuracy with which it will follow rapid changes without excessive, and sometimes without perceptible, oscillation due to the inertia of the moving liquids. The best results are obtained when the cross-section of the passage at the bottom of the mercury columns is so proportioned as to give the proper damping effect.

If any given acceleration be multiplied by the time during which it is maintained, the product is the resulting increment of speed. It is therefore evident that the integrated area between the acceleration curve and the datum line up to any given ordinate multiplied by a proper constant is the speed of the car at the corresponding instant. This constant, or the speed per unit of area, is equal to the scale of abscissas multiplied by the scale of ordinates.

Another useful application of the accelerometer is in the measurement of running friction under different conditions of operation. The accelerometer, as has been explained, gives directly the effective resultant accelerating force per unit of weight. If, therefore, we know the mass moved and the force applied at the axle or drawbar, we readily obtain the friction loss at any instant by comparison of this force with the indication of the accelerometer.

From the above, it will be seen that an instrument of the class described, although not strictly an instrument of precision, is of great practical value to the railway engineer, and it is to be hoped that improvements may be made in the near future that will still further enhance its value as a testing instrument.

DISCUSSION.

It was shown in the discussion that the inertia indicator is not new, and Mr. Wilfred Lewis called attention to a small instrument of the same character as the one described in the paper which he brought out a number of years ago to measure the acceleration of traveling cranes at the Sellers works. The instrument can be made to work on a steady object such as a crane, but it is likely to lag and must be very unsatisfactory on railroad work. It is particularly undesirable that any instrument of this sort should depend upon the eye for its readings as this method is not only unreliable but too slow.

A satisfactory method of measuring acceleration was described to consist of a clock making and breaking a circuit at half-second intervals, a contact on the axle doing the same at each full or half revolution of the wheel and a double-registering telegraph instrument, by which the closing of the two circuits are registered side by side on a moving strip of paper. In this way time intervals down to the twentieth of a second are easily measured, while distances can be laid off equal to the whole or semi-circumference of the wheel. With this record at hand the acceleration curve can be plotted with great accuracy.

Massachusetts Railroad Commissioners' Report.

The main part of the Thirty-third Annual Report of the Railroad Commissioners of Massachusetts was summarized in the *Railroad Gazette* of Jan. 31. The part relating to street railroads has now been issued. The number of companies reporting is 119, of which 18 are new companies. The total length of main track operated is 2,215, an increase of 243 miles. The mileage includes the 6.64 miles of elevated road in Boston. The mileage owned, 1,905 miles, includes 23 miles in Rhode Island; and the mileage operated includes 55 miles outside of Massachusetts.

The extensive construction of new lines during the past year has necessitated 98 new bridges, of which 77 were of metal. There are now on the street railroads of the State 305 bridges. Bridge Engineer Swain makes a report showing the length and character of all the new bridges,

and on the strengthening and renewal work done during the year. He has prepared complete specifications for street railroad bridges, which will appear in the appendix to the report. He says that the placing of this matter under the jurisdiction of the Commissioners (in 1899) has resulted in better bridges. Some bridges built before that time do not come up to the present standard requirements.

The Commissioners say that some of the street railroads of the State are in bad physical condition, owing to haste in building and other errors. This bad condition, impairing the service to the public, should be promptly remedied, even though the expenditure might embarrass the companies somewhat. The Commissioners expect decided improvement in many cases during the present year. The Commissioners are watching the operation of the roads and will see that additional safeguards are introduced where necessary and practicable. The elevated railroad in Boston, opened last summer, has proved popular, the people quickly leaving the surface for the elevated cars to get the advantage of the increased speed. The accommodations, even now, are not what they should be, and additional facilities should be provided. It is not stated what these facilities should be. The opening of the elevated road was accompanied by many annoyances. Some of these have been done away with, and the company is carefully studying remedies.

The principal statistics in the report are as follows:

	Street Railroads of Massachusetts, Year Ending Sept. 30.	1901.	1900.
Capital stock	\$54,069,933	\$48,971,168	
Funded debt	34,312,500	34,373,000	
Unfunded debt	15,215,609	11,718,778	
Cost of road equipment, land, buildings, etc.	96,434,158	83,497,941	
Gross earnings from operation	21,766,340	19,999,641	
Operating expenses	14,565,141	13,159,947	
Percentage of expenses	66.92	65.80	
Net earnings	7,201,199	6,839,694	
Taxes	1,555,787	1,347,119	
Interest paid	1,893,668	1,782,797	
Dividends	3,417,117	2,409,874	
Percentage of same	6.32	4.92	
Cars	6,997	6,531	
Other vehicles	2,488	2,371	
Car miles	93,005,225	81,750,768	
Passengers carried	433,526,925	395,027,198	
Passengers killed	20	18	
Employees killed	17	3	
Employees injured	60	84	
Other persons killed	39	48	
Other persons injured	797	736	

The gross earnings include \$21,339,480 revenue from passengers; \$51,897 from mails and merchandise, and \$374,963 from rents, advertising, etc.

The Commissioners recommend that the street railroads be required to send prompt reports to the Commission of accidents, the same as is done by the steam railroads.

Smoke Abatement in St. Louis.

In a paper on the above subject, read by W. H. Bryan before the Engineers' Club of St. Louis, Oct. 2, 1901, and published in the December *Journal of the Association of Engineering Societies*, the author reviews what has been done to prevent the smoke nuisance in St. Louis. The paper includes illustrations of several stokers and boiler settings, and also gives an act of the General Assembly of Missouri and a city ordinance of St. Louis bearing on smoke prevention. The following extract gives some fuel costs and evaporative values as compiled by Mr. Bryan, with the qualifying clauses which he has added:

"As indicating in a general way what may be done under boilers with the various fuels coming to this market I have prepared the following table. No claim is made for the absolute accuracy of the figures, but they are believed to be fairly reliable, relatively at least. A glance is sufficient to show that the smokeless fuels are out of reach in cost, except as the use of powdered coal may be developed.

Fuel.	Calorific value, dollars, cu. ft.	Heat units, Per 1,000 cu. ft.	Evaporation in rating, per cent.	Equivalent weight, lbs. of water.	Cost of evaporation, per 1,000 lbs. of water.
Fuel gas	0.10	240,000	80	198.8	50.30
Anthracite	6.75	14,000	75	10.87	31.08
Texas oil	8.03	15,950	80	13.22	30.56
Coke	4.50	12,500	70	9.05	24.87
Pocahontas	4.75	13,300	72	9.90	24.00
Big Muddy	2.50	12,200	68	8.57	14.60
Mr. Olive, lump	1.60	11,200	65	7.53	10.62
Powdered coal	1.25	10,000	80	8.28	7.55
Common slack	0.90	10,000	60	6.20	7.25

"The deliveries in this table are assumed to be on cars at consumer's switch. The oil weighs 7.43 lbs. per gal., and costs 3 cents per gal., 2½ cents of which is freight. The oil companies hope to reduce the price in the near future to \$1 per bbl. of 42 gals., but even at that figure it would still fall short of competing with coal in the St. Louis market, even after an addition of 40 to 50 cents per ton for coal and ash handling is made. The outlook for oil is much better if, instead of burning it under boilers, it be used in oil engines of the Diesel or other modern type, which consume about $\frac{3}{4}$ lb. of oil per i.h.p. hour, at a cost of 0.30 of a cent. The ordinary Corliss engine uses about 4 lbs. of Mount Olive coal per i.h.p. hour, costing 0.32 of a cent. In the table above it is assumed that the powdered coal is made from ordinary slack, at an additional cost of 35 cents per ton for powdering. As a matter of fact, this charge would be offset by the saving in labor for coal and ash handling."

*Extract from a paper presented at the New York meeting (December, 1901) of the American Society of Mechanical Engineers.



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The Safety of Trains in the Fourth Avenue Tunnel— The Commissioners' Preliminary Order.

The New York State Railroad Commissioners have modified the speed order which they issued after their investigation of the collision at Fifty-ninth street, New York City, Jan. 8, and they now permit trains to run through the tunnel at 24 miles an hour (instead of 18). This permits the passage of the whole length in five minutes, and as a train running at that speed can be stopped, even on a 50 ft. grade, in less than 300 ft., the most timid ought to be satisfied. The enginemen said that at 18 miles an hour their view was obscured much of the time by their own steam. The only reason learned by the reporters for the modification of the order is that a number of the enginemen reported to Mr. Franklin that they could not get in on time—which the Commissioners must have known already. The passengers and the railroad officers have been annoyed by the eight, ten and twelve minute delays (in the congested hours) during the 18-mile regime, but there has been no loud complaint.

But there will undoubtedly be some irritation, even at so good a speed as 24 miles an hour, when hot weather comes, for then every minute in the tunnel will be an added annoyance to people who have habitually ridden through it at 30, 40 and 50 miles an hour. The question is still pertinent, then, whether a low speed limit is necessary to safety.

The recommendations which were made by the Commissioners are expressly characterized as "preliminary," and the speed rule is for "present conditions," so that it may not be proper to criticise the order as though it were permanent and unalterable; and, moreover, the Commissioners will be disposed, very likely, to throw a part of the responsibility for delays on the New York Central, as their 18-mile-an-hour rule was but a trifle slower than the road's 20-mile rule which had been issued several days before; but that does not settle the question of the wisdom or expediency of the rule itself. In dealing with a terminal at which unavoidable delays occur frequently, and with trains carrying many thousand regular daily passengers, even small delays are to be tolerated only when there is no cure for them.

The Commissioners' recommendations in the preliminary order, except the speed rule, were all in the right direction, though they have not as yet worked any tangible improvement. They embrace seven points: (1) A speed rule of 18 miles an hour. (2) No oil lamps in cars. (3) Enginemen must be piloted 100 trips. (4) Engines must not emit smoke. (5) More accurately-shaped lenses must be used in signal lamps. (6) Green lenses must be made a lighter shade. (7) Lamps must have circular wicks.

In the matter of car lamps the New York Central is said to have all its cars equipped with gas already; but the New Haven Company has secured a suspension of the order to give it time to get rid of its oil lamps.

The third recommendation is useful, but may not be sufficient. The order is of no great consequence just at present, because, as in the case of the speed regulation, the company has, no doubt, taken measures in that direction already, of its own motion. The order will impose a perpetual penalty of \$100, more or less, on the company, in connection with each new runner appointed, as a punishment for having put an engineman not sufficiently experienced on one of these runs. But an essential point in Wisker's failure appears to have been his anxiety to make time; and, this being so, the thing in which he needed training was not simply familiarity with the tunnel but familiarity with the responsibility of running a train with which he deemed it important to make up time. A man might make a thousand trips through the tunnel without being brought to a true appreciation of this feature of the work. If his training trips were all made on easy trains, the dangerous risk which he would take in assuming that a signal would be clear for him, when he had no right to act on an assumption, might not be brought home to him until he should see some other runner get into trouble on that account; and he might not have this opportunity for a year. In short, the fitting of a man for the position of engineman on a passenger train which must be run at high speed, and in which position unforeseen emergencies may at any time arise, can be done only by a course of careful training, continued a long time. The 100-trip rule and the low speed rule, taken together, may accomplish the purpose now aimed at; but no one would think of defending such a combination on any rational basis.

The question of smoke has little to do with the present discussion, for the reason that there is much more trouble from steam than from smoke. The smoke nuisance is felt chiefly in the passenger cars. Doubtless the Commissioners, in making the recommendation, were thinking more of the passengers' comfort than their safety. We may remark in passing, that gas from anthracite burning engines is fully as offensive in the cars, when running through the side tunnels, as anything ever thrown off by a soft-coal burner.

There can be no objection to having lenses in signal lamps as nicely made as the lenses of a telescope; but as no evidence has yet been given to show that the lamps now in use do not throw a good light, an ample sufficient distance, the discussion of lenses costing several dollars apiece seems to us quite academic. The degree of color in the green lenses is also a point of secondary importance, and for the same reason.

We have intimated that the speed rule is the one feature of the Commission's recommendation which is open to the most serious criticism. We do not mean by this that we condemn it, absolutely. If, as appeared from the reports of the Coroner's inquest, the enginemen, or even a very few enginemen, have any fear that they will be censured, or given poorer jobs, when they run through the tunnel so cautiously as to lose time, it is of the utmost importance to eradicate that notion from their minds; and, if prescribing a long-time limit for the two-mile run is the only way of doing this, why, the time limit is the proper thing. But such a remedy can hardly be regarded as justifiable, except as a temporary measure. The suburban public will not stand slow schedules after the shock of this accident is dulled.

The question of the safety of the tunnel has been considerably befogged by considering the eight miles of track as a whole. It should not be so considered. Each signal must be taken by itself. Those which Wisker disregarded are much less likely to be obscured by smoke or steam than are some others. Admitting that a low speed is necessary in the side tunnels at Eighty-sixth street, no such limit is shown to be necessary at Fifty-ninth street, on the center tracks. The case of Wisker and his responsibility, which received but little attention at the inquest, appears to have been relegated to a secondary place by the Commissioners also. The conduct of the 18 other enginemen who have disregarded signals during the past year comes in for the main share of the discussion.

Taking the hardest problem, the signals most unfavorably located, what are the Commissioners required to do, as regards signals and speeds? Simply to see if the enginemen are provided with the best possible means of finding the distant signal. It is the distant signal that gives them the essential information about stopping; the home signal merely tells them where to stop. The obvious way to facilitate finding this signal is to provide more landmarks (assuming that there are not enough already). In a dark tunnel a single 16 c.p. electric light, to be seen 50 or 100 feet before reaching the signal, would be such a landmark. Probably such a light should be mostly enclosed in

frosted glass, so as not to dazzle the enginemen's eyes. It could be hooded, if necessary. It should not be visible far away, the main thing being to have the engineman see it (he does not need to turn his head) when he passes it. Two lights, at intervals, would be better than one. A row of 10, placed 100 ft. or 200 ft. apart, would be ample for the most heedless engineman imaginable. Lights beyond the distant signal do not constitute an adequate safeguard, because it is at the distant signal that the engineman must have his information, whether or not he is likely to be required to stop.

Landmarks of this character could be hung so that the cab window would pass within 18 inches of them. The row should extend back far enough toward the last preceding signal so that in case one or all of the lights should fail, the engineman would notice their absence a good time before he reached the distant signal. In such a case he would of course have to reduce speed until he got to the signal. To obviate the necessity of counting the lights in a row, they should be fixed on an ascending or descending line, the last one, close to the signal, being five or six feet higher (or lower) than the one at the beginning. This would provide a means of estimating the distance traversed, howsoever high the speed might be. In the Baltimore tunnel landmarks are provided every 1,500 ft. by putting one, two, three or more lights in a vertical row.

In the Fourth avenue cut the overhead bridges are about 260 feet apart, center to center. With a light at each bridge, an engineman running 60 miles an hour would encounter one about every three seconds. That, certainly, is often enough. None but a wilfully heedless person could "lose his bearings" in that time. At that distance apart, 10 lights would cover the distance from each distant signal back nearly or quite to the preceding home signal, so that enginemans would not at any time be without adequate landmarks.

So much for simple landmarks. The reader already knows, of course, about the scheme of a continuous row of distant signals which was once tried in the Weehawken tunnel. With such a scheme shorter blocks can be made—the signals being made to overlap one another—thus slightly shortening the time interval between trains, but that scheme is more particularly adapted to purely automatic signaling. The shortening of the blocks necessitates additional electrical instruments. In the Fourth avenue tunnel there is no thought, apparently, of doing away with the attendants; and, of course, a string of constantly burning lamps is much simpler to maintain than an elaborate system of signals controlled by trains through the means of electro-magnets or by signalmen guided by train movements.

Getting trains through the present Fourth avenue tunnel safely, with steam locomotives, is a question of speed and discipline. The record of the past 11 years, and the testimony of the New Haven engineman show that the enginemen have found the signals, under the most adverse circumstances. Now, have they done this with satisfactory regularity, while still making an average speed of 30 or 40 miles an hour? If they have, the need of additional landmarks cannot be called a pressing question. (A record of 18 defections in a year, or of twice that number, does not throw much light on the broad question. Those 18 may be only cases of poor discipline with new men.) Or, have the runners made these speeds only by taking chances, running 100 ft. past the signals occasionally, and then bribing the signalman not to report them? If such is the case, probably both better landmarks and better discipline are needed. With home and distant signals which can always be easily found, the only speed limit necessary is an order to never pass the distant signal so fast but that the train can surely be stopped before the cowcatcher passes the home signal. With distants 1,200 ft. from the home signals, and the most efficient brakes, this means a good deal faster than 24 miles an hour.

The Railroad Commissioners' Report on the Tunnel Collision.

Since writing the foregoing article we have received the Commissioners' report of Feb. 6 (issued Feb. 8); but there does not seem to be any reason for changing anything that we have written. The Commissioners do not modify any of the opinions that they expressed in their preliminary order, so that their two sets of recommendations are to be taken together.

The report says nothing about the need of better facilities for finding the signals, and one might therefore conclude that the openings in the roof of the center tunnel and in the sides of the side tunnels constitute all the landmarks that are needed; but at

the same time they recommend two lights where one is now provided, which indicates that there is need of some improvement. As we have already set forth our reasons for holding that the distant rather than the home signal should be made more serviceable, we need not comment here on this feature of the report; though it is to be observed that where two lights are used for a stop-signal the natural way to arrange them from the signal engineer's point of view, is in a horizontal line, not a vertical. It cannot be that two lights two feet apart will be visible at a much greater distance than would a single light; except that under some conditions steam might obscure one, but not the other. The recommendation to put the distant signals as high as the home signals will, very likely, prove wise. This will deprive the runners of their present advantage of being able to distinguish a distant from a home signal by its height; but in this tunnel there is no reason why every runner should not easily distinguish them by their location.

The essential findings of the report may be summarized as follows: (1) Engineman Wisker was inexperienced; (2) the company was grossly negligent; (3) also negligent and unprogressive in not enlarging the terminal yard; (4) the discipline of engineers was lax; (5) one block station should be abandoned and one moved away from the tunnel; (6) each home signal should have two lamps, one above the other.

On the main points—the first, second and fourth—we need express no opinion now. The Grand Jury is to investigate the matter, and it is only wise and proper to leave a subject so grave as the indictment of the officers of the company to that body.

Questions of safety and questions of convenience usually need to be considered quite differently, one from the other; but the two are not separated in this report, and it is therefore difficult to deal intelligently with some of its points; but the third and fifth points, and probably the sixth, are mostly or wholly matters of convenience. It is true that the congestion in the yard tends to produce danger in the tunnel; but so does any increase of trains anywhere increase danger. Making two blocks into one will do away with one signal in each of the dark side tunnels, but it will make outward train movements slower, and thus may increase congestion in the yard. This impairs convenience instead of promoting it. In the approach to a yard the length of the block sections should be varied according to the increasing or decreasing speed of the trains. This abandonment of the 788 ft. section violates this rule. There seems to have been some discussion before or in the Commission about short block sections being more dangerous than long ones; but if they really are especially dangerous, it is because the block system per se is dangerous, which means that sections of any length are unsafe. To move the Ninety-eighth street signals may slightly increase the convenience to the enginemen, but if it destroys the uniformity in the length of adjacent block sections it will at the same time cause slight delays.

The Commissioners say that they are going to keep watch of the operation of the tunnel; so that, if they find that any further recommendation is needed, we may expect to see it forthcoming; but as it will take two years to make any material improvement in the road or road conditions (except the provision of two additional main tracks for a short distance near Fiftieth street), the present chief duty seems to be to do what it is possible to do to cure those defects which have been brought out by this investigation. These are:

1. Careless or untrained enginemen.
2. Careless or incompetent appointing officer or officers.
3. (Apparently) difficulty in finding some of the distant signals.

On the first two points we gave our views in the issue of Jan. 17; on the third, in the article above this one. On the general question of the adequacy of the terminal, the smoke nuisance, electric traction, etc., we have repeatedly spoken.

The Interstate Commerce Law.

Senator Elkins has introduced in Congress a bill to enlarge the powers of the Interstate Commerce Commission, which is described as a compromise measure, designed to secure the support of all important interests, though Senator Elkins himself says that it will not entirely suit either side, and, therefore, "may meet with strong opposition." It provides that the Commission may, on complaint, prescribe rates for the future, and an order in such a case shall go into effect in 30 days; but the railroad

may appeal to the Circuit Court, and pending appeal the order is suspended, unless the Court, after a hearing, says otherwise. A court may "cause" additional testimony to be taken. An order of the Commission shall remain in effect one year only. It may prescribe the divisions of through rates if the roads do not agree. The bill legalizes rate agreements and pools; but, on complaint, the Commission may order a pool annulled or modified; and if the railroads do not obey, the pool becomes null at the end of 30 days. The circuit courts are to issue injunctions, on evidence that a road has disobeyed an order of the Commission, and may impose a penalty of \$10,000. If a road offends in the matter of traffic over a railroad to or from a foreign country, the Court or Commission may suspend the movement of the traffic within the United States until the road obeys. An offense against the Interstate Commerce law by a corporation is a misdemeanor, if the same would be a misdemeanor when committed by an agent; and the fine may be as high as \$20,000. Wilful complicity of a shipper is punishable in the same way. Imprisonment is abolished. If the Commission believes that a road is cutting rates it may go to the Circuit Court, which court, if satisfied with the evidence, shall enforce observance of tariffs, and the injunction may be directed to shipper or consignee as well as to the railroad.

Whether or not there is any more hope of action by Congress now than there was a few weeks ago, when reports were very conflicting, we are unable to say. In December it was said that the principal railroads—meaning presumably the principal roads in the East—had agreed upon a bill, to be laid before Congress, authorizing pools, and giving the Interstate Commerce Commission authority to regulate rates on pooled freight, but subsequently it appeared that this agreement, whatever it was, had fallen through. It is now said that railroad officers who keep in touch with Congress do not expect to see that body do anything at all about interstate commerce at the present session. But the sponsors of the Nelson-Corliss bill—said to be favored by the St. Louis millers—seem to hope that their bill and Mr. Elkins' can be adjusted in committee. One of the millers specifies the following points of difference between the Elkins bill and his own:

The Elkins bill limits the time within which the order of the commission shall be effective to one year, instead of two, as in our bill, and omits the provision giving the commission power to extend its decisions. The Elkins bill provides that an order of the commission shall be suspended pending proceedings in review in court unless ordered otherwise. The Nelson-Corliss bill provides that the filing by the carrier of a petition for review shall of itself suspend the order for thirty days, and that the Court may further suspend such order if found to be based upon error of law or unjust or unreasonable upon the facts. We maintain that it would be unwise to suspend the commission's orders during review unless good cause shall appear.

The Elkins bill provides that the Court shall hear the case upon record before the commission, and such additional testimony as the Court may decide necessary shall be taken, while our bill provides that all additional testimony shall be taken by the commission under the direction of the Court.

The Elkins bill apparently makes the commission the defendant in proceedings for the review of its orders. Our bill makes the United States the defendant. The commission should not be required to appear in court to defend its orders, and the record in the case should speak for itself. The Elkins bill authorizes the carriers to pool. While probably 90 per cent. of the shippers of this country would be willing that the railroads might enter into traffic agreements, subject to disapproval of the commission, I believe that there are very few shippers who would be willing to have this section enacted, repealing as it does, the anti-pooling provision of the act and the anti-trust law so far as it affects railroads. If pooling is permitted, an order of the commission annulling practices thereunder should be final. The Elkins bill provides for a minimum fine of \$1,000, which, I think it must be conceded, is too small a penalty. Our bill provides for a minimum fine of \$5,000, which is small enough to insure the proper observance of the law.

The main reasons for expecting that Congress may take some action at the present session are (1) that the recent confessions of rate cutting have somewhat clarified the public mind, and (2) that the Commission is now willing, apparently, to abolish imprisonment, even if it does not get an enlargement of its powers. The annual report of the Commission seems to have been received by the public with considerably more of intelligent appreciation than has been shown in past years. This is an encouraging sign, as far as it goes, though it is still true that the great majority of the editorial comments are made up mostly of good wishes and conventional patriotism, with little that shows evidence of study of the problems which the report discusses. Such editors as do try to dig into the question of rate-regulation find themselves driven to government ownership as the only remedy for present evils which is simple enough to be safely talked about, and therefore they of necessity confine themselves to vague recommendations. A few, who formerly maintained a cautious and inquiring attitude, now definitely recommend that Congress give the

Commission the powers that it asks for; but the only reason for this change of attitude appears to be the discouragement engendered by the long years that have passed without anything being done. No reasons are adduced. But the remarkable confessions of law-breaking which have been made lately at Chicago, Kansas City and Washington, by railroad officers and shippers who otherwise were respectable members of society, have produced a decided effect on editors of all classes; so that for once we see a positive suggestion; the suggestion that palpable violations of the law should be stopped.

Aside from the question of imprisonment, however, the rate problem is about as complicated as ever—and pretty nearly as difficult. In speaking of complication, we look at the question from the government standpoint. From the railroad or business standpoint the problem of maintaining stable rates is probably somewhat simplified by the unification of the interests of important railroads which formerly were sharp competitors. To some extent this is evident already, but it is too early yet to speak definitely.

We say that the difficulties are nearly as bad as ever. In the two particulars above mentioned, it may be that they are now somewhat ameliorated. The clause abolishing imprisonment of freight agents should be promptly adopted, thus perhaps greatly facilitating the punishment of railroads which make secret rates. Mr. Hines will not be at all mollified by the Elkins bill, for he declares that the right of appeal to the court is a worthless remedy. This is one of the vital questions in this whole problem. A railroad aggrieved at any decision of the Commission must be alert to make its protest promptly, and yet the protest may need the evidence of the experience of the coming three or six months to support its reasonableness; and, as Mr. Hines has pointed out, a protestant will have an unusually heavy burden of proof to bear, for the Court will presume that the Commission, performing a legislative, not a judicial, act, is wise and just; whereas railroad traffic officers claim (1) that no amount of wisdom can safely fix all rates for a year in advance, and (2) that five lawyers, not specially trained in rate-making and railroad management are likely to sympathize too much with that side of the controversy which they do not understand—the shipper's side.

The immediate question with the Commission is, no doubt, what to do now. The Commissioners say that they cannot convict the rate cutter, even when they catch him, because they must prove not only that the favored shipper paid a low rate, but that some other shipper paid a high one. Vice-President Walker D. Hines, of the Louisville & Nashville, in a pamphlet which he has issued since the Commission's report came out, says that this is not true; that the court decision referred to by the Commissioners expressly states that deviation from the tariff is a \$5,000 crime; and he says that the Commission might have enforced the law against secret rates. Which of these views is right we will leave to the lawyers to settle; but it would be necessary, we should judge, to grant to the Commission a good deal larger appropriation than it now has, if it is to even make a beginning in the task of exposing rate-cutting in the courts. We have always thought that if rate cutting were to be followed up as vigorously as, for example, the Government follows up illicit distillers or offenders against the banking law, much more tangible results would be obtained. The Commission also asks for a better statutory warrant for getting at the books of railroads. Here, again, we supposed that the lack of men and money to investigate and prosecute, was the real obstacle. The law gives the Commission power to "inquire into the management of the business" of common carriers, and there certainly cannot be a more suitable place to begin such an inquiry than where there is a prima facie case of deliberate violation of a plain statute.

What the Commission is to do with the law-breakers who have confessed does not yet appear.

On the main contention of the Commission, that competing railroads should not be allowed to make rate agreements unless the Commission is first empowered to directly regulate rates, it is not necessary for us to repeat that we think rate agreements would not be dangerous to the public; that they would not enable the railroads to make unreasonable advances in prices. Neither do we need to reiterate the conviction—which, we think, is held by all conservative authorities—that if the Interstate Commerce Commission is to exercise important powers over rates it should first be invested with all those attributes of our Federal courts which have given to the courts the high character that they now possess.

As to pooling, it may be that many of the railroads

would not very warmly thank the Government for the privilege. Mr. Stuyvesant Fish, president of the Illinois Central, lately said:

"I am now and always have been unalterably opposed to pooling by railroads, and I am not an advocate of any remedial legislation as a cure-all for the ills that affect the rate situation. Pooling would not effect a cure of the disease for which it is purposed to be prescribed. The conditions that surround the freight situation are so manifold, so diverse, and so widely adverse as to interests affected that pooling is impracticable. Wholesale pooling would result in the construction of parallel lines all over the country and in places where there are now more railroads than the tributary country will support profitably. Good faith as between traffic officials, rigid enforcement of the present Interstate Commerce Law, and a reversal of the Supreme Court construction of the Sherman law to the effect that it is illegal for railroads to make agreements among themselves of any character whatsoever, constitute the essential elements necessary to secure stable rates."

Speaking with regard to the prevalent view that the Interstate Commerce Commission was powerless to enforce the law against rate-cutting or secret rates, Mr. Fish declared that this was a mistaken theory. He asserted that the law gave the Commission power to punish such violations. "In fifteen years it has never been administered in this respect, and it seems to me that it is time its efficacy was tried."

We have noted these features of the present situation, not because we feel able to mark any progress, but merely to put together the main points at issue. The Commission has made one move on the chess board, and Mr. Hines is pressing his views on the public with increased vigor; some of the railroads have relieved their souls by confession, and for the first time have got some shippers to confess with them. With all these things it is possible that some progress may be made before long.

The Hungarian Railroads in the year 1900 had a passenger traffic equivalent to 185 persons carried each way daily over the whole mileage. About two-thirds of the travel was third class; less than 3 per cent. first class. The average journey was $22\frac{1}{2}$ miles, the average receipt per passenger mile 0.915 cent, the average passenger earnings per mile of road \$1,266. The freight traffic was equivalent to the movement of 460 tons each way daily, and the average length of haul was $77\frac{1}{2}$ miles. The average receipt per ton per mile was 1.212 cents, and the freight earnings per mile of road \$3,685. The total net earnings were 3.36 per cent. on the capital. The total number of employees was 89,479. = 8.47 per mile of road, and their average yearly pay was \$211.

It is reported that in the station at Irkutsk on the Siberian Railroad a notice is posted that passengers who wish to continue the journey eastward over the Chinese Eastern Railroad must sign an agreement that they will not hold the railroad company responsible for any accidents on the journey from which they may chance to suffer. Some indignation has been expressed thereat; but it must be remembered that when the track was opened through to Vladivostock it was expressly stated that the road would not be complete and open for public traffic for nearly two years. Passengers are, apparently, now accepted by favor and not by right, much as contractors have carried them in this country provisionally before the roads they were building had been turned over to the companies.

NEW PUBLICATIONS.

Power and Power Transmission. By E. W. Kerr, M.E., Assistant Professor of Mechanical Engineering, Agricultural and Mechanical College of Texas. Svo., xii + 356 pages, 264 figures. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1902. \$2. Mr. Kerr divides his book into three principal parts, being Machinery and Mechanics; Steam Power; Pumps, Gas Engines, Water Power, Compressed Air, etc. He tells us that the book is made up largely of the subject matter of lectures, delivered by him to students, of the elementary principles of engineering. He does not claim to have presented much that is new, but to have made a collection of principles and information useful to the beginner. Within the limits that he has set for himself he has made a book which will be found convenient and useful, but it is necessarily quite elementary as must be the case in an effort to cover in one volume the vast field which he has taken. Many of the engravings are from the electrotypes of manufacturers, which naturally detracts a good deal from the appearance of the book; but they serve their purpose very well.

Practical Calculation of Dynamo Electric Machines. Continuous Current Machinery. By Alfred E. Wiener. Large octavo; 728 pages; engravings and index. Second edition revised and enlarged. New York: Electrical World and Engineer. 1902. \$3.00.

The first edition of this work appeared late in 1897. The aim was to produce an entirely practical treatise on dynamo calculation. The author tells us that his treatment on the subject is based upon results obtained in practice and therefore gives practical experience. The information gathered is presented in more than 100 original tables and nearly 500 formulae from data and tests of over 200 modern dynamos. In the second edition

a few changes have been made in the tables as the result of the experience with later machines; and some new tables have been added. Three appendices have also been added, giving dimensions and armature data of various types of modern dynamos; giving also wire tables and winding data, and finally, an appendix gives the causes, localization and remedies of the usual troubles in dynamo electric machines. The work has become a standard and its scope is sufficiently indicated in the title and in what we have said above.

Guide to the Great Siberian Railway. Published by the Ministry of Ways of Communication (St. Petersburg). Edited by A. I. Dmitriev-Mamonov and A. F. Zdziarski, Railway Engineer; Large octavo; 520 pages, with two phototypes; 360 photogravures; four maps of Siberia; and three plans of towns. New York: G. P. Putnam's Sons. 1900.

This handsome volume is a good deal more than its title suggests. It is a description of the Siberian Railroad, as a railroad, with a considerable account of its building; and it is also an account of the geography, history, trade and people of the great country crossed, and of the countries tributary to the railroad. It has an appendix, giving fares and time tables between St. Petersburg, Moscow, Warsaw, and the chief stations of the Siberian Railroad, giving also time tables and fares for the various divisions of that road. The maps and plans are not so convenient as one would wish, inasmuch as the names which appear on them are mostly in Russian characters, although a few have been transcribed into Roman characters. Furthermore, the volume is without either table of contents or index. In spite of these drawbacks, however, it is the most complete description of the Siberian Railroad that we have seen.

Journal of the Iron and Steel Institute. Vol. LX. 1901. Edited by Bennett H. Brough, Secretary. New York: Spon & Chamberlain, 1902.

This volume of the Journal of the Institute contains the minutes of the Glasgow meeting with the addresses, reports, discussions, etc. It also contains the usual notes on the progress of the iron and steel industries. It is a volume of 596 pages, with an index.

Transportation.—The January issue of the Annals of the American Academy of Political and Social Science is given up to transportation. The papers in it are: "The Isthmian Canal and Its Economic Aspects," by Prof. Emory R. Johnson; "The Isthmian Canal Question as Affected by Treaties and Concessions," by Hon. Samuel Pasco; "Present Status and Future Prospects of American Ship Building," by Dr. John F. Crowell; "Government Ownership of Railroads," by Hon. Martin A. Knapp; "Advisory Councils in Railway Administration," by Prof. H. B. Meyer; "The Concentration of Railway Control," by Mr. H. T. Newcomb; "The National Company of Light Railways in Belgium," by Mr. Alfred Nericex. The price of this issue of the magazine is \$1, paper, or \$2, cloth; and it may be ordered by addressing the Academy at Station B, Philadelphia, Pa.

TRADE CATALOGUES.

The Jones National Fence Co., Columbus, Ohio, sends its 1902 catalogue, which is a 5 x 7-in. pamphlet of 40 pages. A variety of wire fences for railroad right-of-way are shown, with which the S. B. & B. wire locks are used. With each style of fence is given a bill of material and the cost for fences of different heights. There are also a number of designs of ornamental lawn fences, gates, hitching posts and tree guards, as well as the special tools used in building these fences. The pamphlet also contains wire and spacing tables.

The Brown Fence & Wire Co., Cleveland, Ohio, has issued a catalogue of 56 pages containing first of all an interesting discussion of wire fence construction. Following this are illustrations and data regarding more than a hundred styles of fence. Information is also given about tools and supplies needed in construction. In the Brown fence heavy, large wires are used for both horizontals and verticals and the stays are so designed that they can be used with any size or sizes of lateral wires. Locks, washers or metal bindings are not used.

Freight Cars.—M. H. Treadwell & Co., 95 and 97 Liberty street, New York City, are the general agents of the car shops and works of M. H. Treadwell & Co., of Lebanon, Pa., successors to the Lebanon Manufacturing Co. The principal business of this company is the manufacture of standard freight cars of all classes built entirely of wood. They make also tank cars, ballast and dump cars, hot metal cars, mine cars, etc. They very properly reason that notwithstanding the inroads of steel construction, wooden cars, made to standard types and dimensions, will for many years make up the great bulk of freight rolling stock, and they are prepared to supply this class of cars for any service.

Heavy Lathes.—The Pond Machine Tool Company, 136 and 138 Liberty street, New York City, issues a new pamphlet illustrating a line of heavy lathes running up to an 84-in. lathe, 67 in. over the carriage, having a 22-ft. bed. These heavy lathes are regularly made in stock size, are uniform and interchangeable, and prompt deliveries can be made.

Baldwin Ten-Wheel Locomotives for the Missouri Pacific.

The Baldwin Locomotive Works delivered two 10-wheel simple engines, suitable for fast freight or passenger work, to the Missouri Pacific about the middle of December. The locomotives were assigned to the Missouri division of the St. L., I. M. & S.; that is, from St. Louis to Poplar Bluff. Some of the principal features of the locomotives are here given:

Cylinders.	19 $\frac{1}{2}$ in.
Diameter.	28 in.
Stroke.	Balanced
Valves.	
Boiler.	
Diameter.	66 in.
Thickness of sheets.	5/8 and 13-16 in.
Working pressure.	200 lbs.
Fuel.	Soft coal
Fire-box (Vanderbilt) tube length.	131 in.
Fire-box.	O. S. diam., 63 $\frac{3}{4}$ in.; thickness, $\frac{3}{4}$ in.
Tubes.	

Material.	Charcoal iron
Number.	350
Diameter.	.2 in.
Length.	13 ft. ft.

Heating Surface.	
Fire-box.	135 sq. ft.
Tubes.	2,367 sq. ft.
Total.	2,502 sq. ft.
Grate area.	33 sq. ft.

Driving Wheels.	61 in.
Journals.	.9 x 12 in.

Wheel Base.	
Driving.	13 ft. 6 in.
Rigid.	13 ft. 6 in.
Total engine.	24 ft. 4 in.
Total engine and tender.	5 ft. 11 in.

Weight.	
On driving wheels.	146,290 lbs.
On truck.	28,170 lbs.
Total engine.	174,460 lbs.
Total engine and tender.	274,460 lbs.

Economy of Coal and Fuel Oil Under Stationary Boilers.

Recently we published several articles* descriptive of methods and apparatus for burning fuel oil on locomotives and in this connection the results obtained with these fuels under a stationary boiler are interesting. Trials were made by Mr. M. D. Stewart, Master Mechanic of the Rio Grande, Sierrre Madre & Pacific, with a view to determining the relative economy of coal and fuel oil under ordinary conditions of working. In the near future, data as to the performance of oil-burning locomotives on this road will probably be available, but what follows relates to the stationary shop boiler. Mr. Stewart writes:

This road has for three months been conducting tests to determine the relative economy of coal and oil as fuel. The tests were made at the Juarez shops of the company and covered a period of 90 days. During this time the boiler was fired 45 days with coal and then 45 days with oil, the conditions and work performed during both periods being very similar.

The boiler used is 53 h.p. with return flues, the flues being 5 in. in diam. and 11 ft. 6 in. long. The fire-box is 48 in. long and 59 in. wide. The boiler was supplied with water heated to a temperature of 180 deg. F., and the steam pressure carried was 70 lbs. The engine is an ordinary slide-valve engine of 28 h.p. The coal used was from Strawn, Texas, and the oil used came from Beaumont, Texas.

During the first period there were burned 48.03 (2,000 lbs.) tons of coal, and during the second period there were burned 165.3 bbls. (42 gals.) of oil, resulting in a proportion of 3.44 bbls. of oil to one ton of coal. Fuel oil is sold in El Paso at 74 cents a barrel, at which rate 3.44 bbls. (the equivalent of one ton of coal) would cost \$2.54, as compared with \$5.50 per ton for steam coal.

Another matter may be mentioned in favor of oil for fuel, and that is the consumer pays for the coal at "mine weight," involving a loss from shrinkage of not less than 2 per cent. and often much more. The loss from the same source in oil shipments in tank cars is immaterial.

The most important part of this plant is the absence of both stand-pipe and pump, which are universally used in plants of this kind, to force the oil through the burner. The idea was conceived that if the oil were run to the burner by gravity there would be a great saving of fuel, provided the oil were heated before entering the atomizer; and this proved to be true. Instead of the supply tank being buried, which is the common practice, it is elevated to the height of 10 ft., thus giving the oil sufficient head to flow freely through the burner. Before doing so, however, it passes through a sub-heater which receives its heat from the exhaust of the boiler feed pump.

The burner is inserted through the center of the firebox door, which is bricked solidly, with the exception of an opening large enough to admit the burner and also a "peep" hole to enable one to see if the combustion is right. This is all neatly encased with sheet iron. The free air is admitted to the fire-box through an opening left in the ashpit door. It then flows back to the fire wall, passes through an opening and into a space just below the bottom bricks of the fire-box and enters the fire-box itself, just below the burner. This arrangement enables the air to become heated by passing under the hot bricks, before entering the combustion chamber. Besides the fire wall, that forms the fire-box, and which is placed about 42 in. in front of the furnace, there is another wall

*See *Railroad Gazette*, June 21, 1901, p. 431; Aug. 9, 1901, p. 557; Nov. 8, 1901, p. 767; Nov. 22, 1901, p. 804; Dec. 27, p. 892, and Jan. 24, 1902, p. 56.

midway between it and the back of the boiler. This forms a second combustion chamber, and also retards the velocity of the ignited gases so that when returning through the tubes they receive the full benefit of the heat. No matter to what extent this atomizer is forced there is always a perfect combustion with not a particle of smoke issuing from the stack. It has been in operation for about two months and has practically demonstrated a saving of 55 per cent. in fuel (oil versus coal). This does not include, however, the wages of a fireman, as with fuel oil on a stationary boiler it is not necessary to have one.

Liberty to Work.

Mr. Baer, President of the Philadelphia & Reading, and President of the Board of Trustees of Franklin & Marshall College, at Lancaster, Pa., lately delivered a lecture at the college on work. We cannot give the lecture in full, but certain extracts follow. It is a wise and dignified address and will be useful among those young men who are capable of reasoning.

"Whatever changes the future may bring forth, the great law that every laborer shall be protected in his inalienable right to labor must in all time be a well-proportioned pillar of free government. To-day there is no greater absolute despotism and tyranny on the earth than the power which forbids a man to work because of some other man's quarrels. The nod of a despot, causing the arrest of any man in his kingdom, represents no more arbitrary power than the edict which issues in the name of labor, whereby a workman, without a grievance, must stand with folded arms and see his family suffer for bread, because he is in terror of ostracism, if not the personal violence, which follows an attempt to be a free man.

"Is liberty to work less desirable than liberty to worship? Can the one live without the other? Are we freemen in the sense of the Declaration of Independence, whose liberties are vouchsafed by the Constitution, if there be any power in this broad land to control our choice of labor? Shall we be denied the right to work in the lawful vocations of man because we do not belong to a particular labor organization?

"Let it be said once for all, that it is, as it ought to be, lawful for laborers to organize; to use all lawful means to obtain higher wages and better conditions, and to quit work singly or in a body.

"This is their liberty. But has not every man a similar liberty of action? If he chooses to work at any vocation, and on any terms, is not this his liberty? And what moral or legal right has a labor organization to deprive him of his inalienable liberty to work? Yet, it is being done every day. Men are driven from work, threatened, abused, called all manner of harsh names, their wives and children are insulted, and a social ostracism is established, which compels good, honest workmen to bear the pangs of hunger rather than endure the threats and gibes of their fellow-workmen. In some trades employers are not permitted to employ workmen without labor organization cards. Union men will not work with non-union men. Was ever greater tyranny practiced by one set of men over their fellowmen?

"So apathetic has the public conscience become to the terrorism, tyranny and lawlessness of labor organizations that not only the politicians, who are seeking votes, but well-meaning men, who ought to know better, cry aloud against the decrees of the courts when the principles of Constitutional liberty are invoked in legally-established tribunals to restrain the lawlessness of labor organizations. Government by injunction—as the catch phrase goes—they tell us must cease.

"I rejoice in the steadfastness of the judges, who, in every hour of this nation's life, have been the steadfast defenders of liberty regulated by law, and have turned deaf ears to the cry of the mob, and the temporary insanity of the multitude, and have administered justice and equity between man and man, without a shadow of favor, fear or trembling, on the broad principles of Constitutional law established by our fathers.

"Work will not be worship in this country until it is universally conceded that no man shall be deprived of his right to work, by law, by force, by threats, by social ostracism, by boycott, or by insult; no man shall be denied the right to select his own vocation; no man shall be denied the right to work as many hours as he pleases, and at any price he pleases, and no man shall be boycotted or injured in his business because he employs non-union labor.

"Labor may organize, but it may not tyrannize. Labor organizations hitherto have failed because they have entirely overlooked these simple fundamental truths. Instead of using their utmost endeavors to bring the employee and employer closer together, to know and understand each other better, to sympathize with one another, and to heartily co-operate in every reasonable effort to advance the work in which they are engaged, they have tried to make an impassable gulf between the two.

"If it continues, the present industrial supremacy of the United States will soon be a thing of the past, and we will share the fate of England. It is beyond question true that the primary factor in the decadence of England's industries has been the arbitrary exactions of trades unions. The London papers continue to call attention to the crisis in British industry, and practically agree that British workmen, through their trades unions, are ruining not only themselves but the industry of the country.

"Our friends of the Civic Federation, perhaps realizing how impracticable it is to bring about good results by such a division of employer and employee into hostile camps, have suggested a plan to solve the whole problem. It is based on the delusive and impracticable idea that this stupendous problem can be adjusted to the satisfaction of all by a Board of Conciliation, not selected by the parties in interest, but created by the Civic Federation—a self-constituted Witenagemote—a court without jurisdiction and without a sheriff to enforce its judgments.

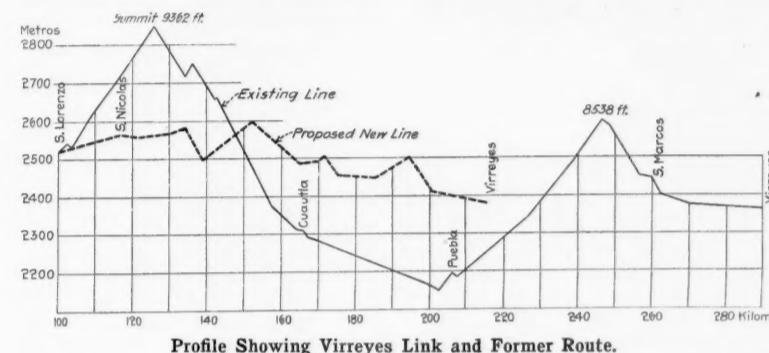
"Much allowance must be made for enthusiastic men who are willing to join in any movement that tends to benefit society. Nevertheless, no practical good can ever come from this movement; but just to the extent that it excites expectations never to be realized, it will work much mischief in the land."

The Interoceanic Railroad of Mexico.

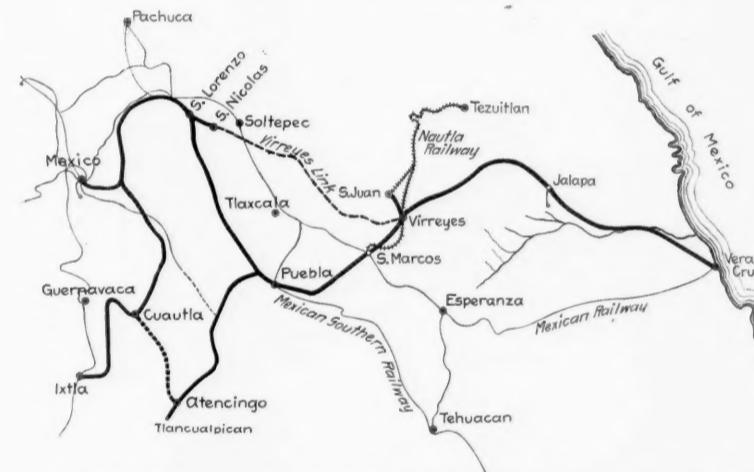
The report of the directors of the Interoceanic for the year ending June 30, 1901, gives the length of the company's line in operation as 555 miles. The total receipts were \$4,211,085 in Mexican currency, the value of the Mexican dollar being approximately 46 cents. The working expenses during the period were \$3,217,092, Mexican. The year before the receipts were \$4,166,678, and the working expenses \$2,977,214, so that the net profit showed a decrease during the last working year from \$1,189,463 to \$993,993. The reasons for this increase in working expenses and consequent decrease in

not to exceed £400,000 of this debenture capital, and it is proposed that a lease shall be made under which the Interoceanic Co., after the completion of the Virreyes line, will take over the property of the new Mexican Eastern for a period of 80 years, at an annual rental sufficient to meet the interest on the debenture capital of that company and its general expenses. Any issue in excess of £400,000 will be made only in agreement with this company. The Interoceanic will have an option on the property of the Mexican Eastern at any time after June 1, 1914, upon giving six months' notice, the purchase price to be a sum sufficient to redeem the outstanding debenture stock of the Mexican Eastern at 105. After 1920 the rental will include a sinking fund for the redemption of the debenture stock which will be redeemable at par in 1989.

Owing to heavy grades and sharp curves, the cost of working the Interoceanic has always been high, and this is increased by the fact that the maximum gradients are not concentrated. The heaviest of these on the main line are between Vera Cruz and Las Vegas, and between Puebla and San Lorenzo. The projected Virreyes line will reduce by 48 miles the distance between Vera Cruz and the City of Mexico, and the maximum grade between the City of Mexico and Las Vegas would be reduced from over 2½ per cent., as at the present time via Puebla, to 1½ per cent., with a reduced curvature. This would not only materially reduce the cost of traffic exchanged between points outside Virreyes and San Lorenzo, but would greatly relieve the congestion of



Profile Showing Virreyes Link and Former Route.



Route of the Interoceanic Railway of Mexico, Showing Proposed Virreyes Link.

profits are assigned as the continuing tendency of wages to rise, additional work in the locomotive department, and higher cost of fuel. The expenditure on permanent way also shows an increase which includes the cost of a general straightening of the roadbed rendered necessary by the heavier rolling stock now in use. Freight traffic shows an increase over the preceding year of 27,970 tons, or 4.19 per cent., and the receipts from it show an increase of \$32,414, 1.18 per cent.

The most important work done during the year was the building of the Chautla-Atencingo Link Line, upon which nearly \$350,000 was spent. Work on the line was delayed for some time by the difficulty of procuring labor, but satisfactory progress is now being made and the grading will be completed by the end of the year. The company has had under consideration for some time the purchase of the narrow gage line from San Marcos to Tezuitlan, 79 miles long, known as the Nautla Railway, and the building of a line 61 miles long from Virreyes to San Nicolas. The Board has decided that the control of these two lines is of great importance to the company and that the easiest and most economical way to obtain this is to form a separate company. An option has been obtained for the purchase of the Nautla Railway Company, with a government subsidy of \$300,000 and this subsidy is to be applied to the Virreyes-San Nicolas line, a concession for which has already been secured. The accompanying sketch shows the location of these two lines and indicates by the comparative profiles the important saving, both in distance and grades, which will result from diverting traffic over the Virreyes line. The company formed to accomplish this will be known as the Mexican Eastern, with a nominal capital of £10,000, and a 5 per cent. debenture capital of £450,000. The cost of the Nautla Railway and the building of the Virreyes line and the equipment of both will require an issue of

through traffic on the Puebla section which is now being worked almost to its maximum capacity. The saving in distance between Vera Cruz and the City of Mexico by the new line would be 13½ per cent., but the saving in average length of haul would considerably exceed this, since much of the traffic passing over the Virreyes line would not be carried the entire distance between Vera Cruz and the City of Mexico.

Talbot's New Process of Steel Making.

Benjamin Talbot, of Pencoyd, Pa., has patented an improvement in the art of making iron or steel. It consists of removing carbon very rapidly from molten iron or steel charged into an open-hearth furnace and producing a large volume of carbonous-oxid flame or raising the furnace chamber and the regenerators connected to a high degree of heat, the carbonous-oxid gas evolved burning in the furnace-chamber and the excess of gas unconsumed burning in the regenerator. The result is an economy in fuel and operation.

A furnace connected with regenerators is pre-heated and provided with an initial bath of molten iron or steel purified and covered with slag containing metallic oxide capable of removing carbon, such as oxid of iron or manganese in sufficient proportion to rapidly oxidize the carbon contained in the liquid iron or steel to be treated. The metallic oxide in the slag should preferably be in excess of that required to oxidize the entire carbon contents of the metal to be purified to produce the most satisfactory results. The oxidizing character of the covering of slag is maintained by drawing off portions as the same becomes exhausted and enriching the remainder by additions of mill-cinder, scale, or iron ore and lime or limestone as required. The higher and more uniform the pro-

portion of oxid maintained in the slag relative to the carbon contents of the successive charges of molten metal poured, the more rapid and uniform will be the revolution of carbonous-oxid gas and flame, the higher and more uniform the temperatures maintained, and the shorter the time involved in the reduction of the impure charges. The heat evolved in the operation supplements the effect of the fuel-gases which are employed as in the ordinary practice and has been found to greatly increase the output per unit of plant and to produce a better quality of metal. The operations are preferably carried on continuously.

The metal to be treated may be wholly unrefined or partially refined—as the products of the blast furnace, Bessemer mixed, reservoir, or other furnace—and may contain in addition to the carbon content silicon, phosphorus, sulphur, or other impurities, the removal of which is greatly facilitated by the high heat developed from combining and burning the oxygen of slag and the carbon of the metal treated. It is not essential that all the carbon of the metal in process of treatment should be exhausted, it being in some instances desirable to retain a portion in the bath and in the metal drawn therefrom—say fifteen one-hundredths of one per cent.—the product being either wholly refined in the furnace or partially refined and finished by subsequent treatment.

For the most rapid and satisfactory evolution of carbon and purification of metal the liquid steel bath should, however, be as low as possible in carbon content, downtime traces, the evolution of carbon from the added charges being most rapid when the bath is in substantially purified condition.—*American Manufacturer.*

The Engineer in Municipal Service—A Study in Municipal Control.*

BY ALEX. DOW, ESQ.

You will find my text in the Detroit *Evening News* of April 5, where one of the Public Lighting Commissioners is quoted as saying, "I used to think that municipal ownership was a good thing, but my experience has taught me that it is impossible to divorce public business from politics. It is all politics, and just now the Public Lighting Commission is composed of two Republicans and four Democrats."

It is quite true that the Public Lighting Commission is suffering from politics—Democratic politics, labor politics, reform politics, and just enough Republican politics to season the mess. I suppose the labor men and the reformers object to being called politicians. Perhaps they are not such. Perhaps they are merely playing at being politicians—you know the tale about the man who thought he played poker, but really didn't. . . . In my experience the most offensive partisans have been those who claimed to represent moral agencies. When they were honest, they were doctrinaires; when they were dishonest, their dishonesty overpassed the dishonesty of the politician who admits that he is a politician. My experience is not peculiar. A friend of mine who has paid for his knowledge of city councilors in an Ohio city, where there is an organized reform party, tells me that the only difference between Democrats and reformers is that the Democrats stay bought. . . .

You must not suppose that the politician in office is an idle man. He is exceedingly busy—as busy as the devil in a gale of wind. The trouble is that he is not doing the work he is paid to do. . . . When a practical politician holds an office which gives him the power of appointing other public servants, he attains his maximum power for mischief. He not merely fails himself to earn his salary, but he employs others of his kind with a distinct understanding that they are to justify their employment by work done in the interest of him and his faction. . . .

To return to my text. My experience is different from that of the commissioner quoted. It has taught me that it is entirely possible to keep public business separate from politics, even the public business of that very commission. My experience has led me to believe it possible to divorce public business from politics after the two have formed such an unholy alliance. To keep them separate in the beginning was the work of an engineer, and I now propose to tell how it was done. . . .

The first Lighting Commission was absolutely non-partisan. In its constitution there was the usual recognition of each of the great parties, but each of those six men stood for the whole city and never for a moment for his own political friends. This was as it should be. A bi-partisan board is not a non-partisan board. You cannot neutralize three aggressive Republicans by appointing three equally aggressive Democrats. Two blacks don't make one white, and the result in practice is at best a deadlock. If by any chance a Republican partisan votes with the Democrats, he is called a traitor and there is a howl for his political scalp.

This non-partisan commission decided that its duties were essentially legislative. Its members were business men who certainly could not give attention to details of commission work. You remember that these commissioners are unpaid—well, perhaps I should not put it so, but the payment they get is of the kind best described by a tale concerning our fellow-member, Mr. Frank E. Kirby, who served a term as a Water Commissioner of this city. The Water Board of a large Eastern city visited Detroit in the course of a tour in search of information. Mr.

Kirby dropped his other duties to entertain the visitors, one of whom in conversation spoke as follows: "In our city there are three water commissioners; we each get \$3,600 a year. How many are there of you in Detroit, and what do you get?" The answer was grim, but precise, "There are five of us, and we get hell." The first first Lighting Commissioners were well paid in the coin named by Mr. Kirby. Some of them are, I think, still receiving small instalments of their salary. Be that as it may, they decided that their duties were legislative, and therein they made a wise decision. They sought as their executive an experienced electrical engineer of good administrative ability. They failed to be satisfied by any of the numerous applicants who asked for the position; they made guarded inquiries concerning a number of men who were engaged in such work as they had to do, and they ended by offering the appointment to a man who was about as thoroughly surprised as any one could be by such an offer. That was me.

From the beginning the separation of legislative and executive functions was complete. The commission decided on a policy. I reported on and advised as to possible plans whereby that policy could be carried out. The commission authorized the execution of a general plan presented by me, and then it became my duty to carry out that plan, myself selecting the immediate agents and settling the details. On me lay the responsibility for results. Logically to me was given the choice of means.

Given full charge of the work and the force; given power to employ and discharge help; ordered positively to see that each employee earned his pay; to require no qualifications other than citizenship and competence; to disregard all endorsements which were not supported by my own observation of the work actually done for the commission, it would appear that I should have been able to keep practical politicians out of the service of the Public Lighting Commission. Did I do so? Well, I think I did. I was convinced of it by the fact that the Republican politicians of the city condemned me for a Democrat, and the Democratic politicians cursed me for a Republican. That was at first; after a year or two they sized me up better. Toward the end of my service I had the expert opinion of a recognized authority on such subjects as to whether I had succeeded in organizing a non-partisan force. The authority was the Hon. Hazen S. Pingree. I think no one here will question his competence. The opinion was given to me personally, in explicit language, and at some length. I do not know that it is advisable to quote it in full or verbatim; indeed, my memory fails me. But the salient point thereof was, "You people down there at the lighting plant are political eunuchs." . . .

How did I carry out my plan? Well, I began, so far as the laborers and mechanics were concerned, at the top of a long list, which was arranged according to priority of application. I called for these men in bunches, sized them up personally after the fashion of all engineers who have to hire men; you know how it goes; you don't have to be told that some men are not worth a continental; you can see that by looking at them. I personally hired each man, and the hiring was a big part of my work. . . .

In the original selection of employees many presented the endorsement of local politicians. During the first three years, which were years of very hard times, there was an unusually large selection of employees available. It would have been possible to fill each such place after turning down every man indorsed by a politician. That would, however, have been a mistake. A selection from men indorsed only by the "goo-goo" element of our citizenship would, I think, have furnished about as large a proportion of utterly useless and worthless employees as could possibly have resulted had none but pernicious politicians been chosen. Some of the poorest specimens of mankind that were tried in the service brought the most magnificent endorsements from preachers and from pillars of churches. I honestly believe the average preacher does not know the making of a decent workman. I must expressly exempt the Catholic priesthood from this reproach. I noticed that a man who referred us to his parish priest was almost always a good find. On the other hand, some of the best men whom I found, including men who are still employed by the commission, carried the endorsements of politicians whose reputations are far from saintly. . . . Of course the tough aldermen sometimes sent worthless men to me, but I had an effective method of dealing with such cases. If the man proved worthless, I summarily discharged him, and then I did not wait for his political sponsor to come to me complaining that his man had been "thrown down." I made the announcement myself to the sponsor, and followed it up by a few well-chosen remarks in the vernacular which let him understand that it was his business to know that a man was a good, capable worker before he sent him down to the Public Lighting Commission, and that if the said sponsor did not know any better than to send such a damnable specimen as the one just discharged I would decline hereafter to consider any of his recommendations. I commend this prescription to any of you who may find yourselves in such a position as I then was in. The first dose, if liberal, effects a complete cure.

The places which required technical training were more difficult to fill. I have already mentioned that one place had to be filled by employment of a man from outside the city. The first draftsmen and inspectors were found by inquiry among the manufacturing and technical concerns in town. They were college men, and their coming to the service was followed by a succession of applications for employment from other college graduates,

largely University of Michigan men. The names of most of those men have been on the roll of our Society. The engineering staff of the construction period was formed of these young men, and when the operating force was organized a number of positions were filled from the construction staff. . . .

The steam engineers and similar expert mechanics were selected from the list of applicants. In these classes the plan of putting a man to work and seeing what would happen could not be tried with the same freedom as was permissible with laborers. An incompetent engineer might wreck an engine in demonstrating his incompetence; or an unskillful electrician send himself to paradise by the electric route, and thereby cost the city \$5,000 or so. It is really remarkable how valuable such a man becomes after he is dead. But the method was modified only in degree, not in kind. A man was first questioned and then tried. His endorsements counted for nothing, his politics for less than nothing.

The relations of the plant to what is called "union labor" were very early defined. The first commission announced that it recognized citizenship and competence as being the only essentials for employment. It classed union labor affiliations together with politics and religion, as being immaterial so long as they did not interfere with the performance of a man's duties. It resulted that we made no inquiry as to a man's being union or non-union, and that naturally a large proportion of the men employed were union men. I think the ground taken in the matter was solid, and that it is the only ground which promises permanent freedom from trouble.

It was not sufficient to obtain employees who were free from political obligations. It was necessary that they should remain clear of such entanglements. Our rule in the beginning was clearly stated, and it was reiterated from time to time as occasion required. It was that every employee should have opportunity to vote at primary and regular elections; that there should be no inquiry as to how or for whom he voted, but that no employee should on any pretense engage in what is called party work. . . .

For five years—three years of my service and two years of my successor's term—the relations of the commission to its electrical engineer were unchanged. You will recognize that these relations were essentially those of a board of directors of a corporation to their general manager. In my own case they were exactly the relations which I now hold to the directors of the corporations whose property I manage. They were the relations which exist in every such department in every city whose work is well done and free from political taint. Instances can be multiplied not only of the successful operation of this distribution of duties, but also of the evil results following when any other distribution is essayed. The Chicago newspapers have just furnished an excellent illustration of success and of failure. The success is in the management of the South Parks. In the past and in the present the South Park Commissioners have performed precisely the duties of a directorate of an incorporated company. The name and title on their letter heads, "J. Frank Foster, general superintendent and engineer," means just what it says. Mr. Foster is general superintendent in fact as well as in name. The West Parks have been managed on the other plan. The commissioners have been partisans, and have appointed partisan employees. The general superintendent has too often been chosen for his efficiency as a party worker. The engineer has always been a subordinate, and too often a negligible quantity in the equation. I speak from knowledge, because I have done engineering work on behalf of each of these municipal bodies. The results of the two systems are summed up by the published cost of maintenance per acre of each system. The average cost of maintaining the West Side Parks is \$498 per acre per annum. The average cost of the Washington Park is \$220 per acre per annum. And those who know their Chicago and can mentally compare the two park systems will promptly agree with the newspapers that the conditions of the two systems are in the inverse ratio of the moneys spent upon them.

In Canadian cities the man in charge of public works is usually a civil engineer, and he is actually in charge. The Public Works Committee has legislative functions only, and a law duly enacted, not merely a ruling of a commission, prohibits the activity of any city employee in politics.

I have spoken of the successful operation of the public lighting plant while the functions of the commission and the engineer remained clearly defined. It is now in order to tell what happened when this definition became hazy. After five years' operation of the plant, ill-advised economies, insisted upon by the board in direct opposition to the advice of the engineer, caused a strike of the arc lamp trimmers. The question of detail was whether the trimmers did or did not do enough work for their pay. . . .

The major fact was that the commission, to secure a small economy of operation, overruled its executive officer and ruined the discipline of the plant. The damage to the commission, directly and indirectly, by loss of discipline from that day to this, by the loss of capable employees and the expense of educating others, has offset many times the saving which was expected to be made. The trimmers struck, as I have said, and thereby put themselves in the wrong. . . . That also is a minor detail. The major fact was that the commission assumed control of details which, even had it been competent to judge, it could not personally oversee, and deliberately permitted employees to feel that they had a grievance.

The engineer did his best. He won the strike for the commission, feeling that his duty to the city overrode

*Extracts from a Presidential address delivered at the annual meeting of the Detroit Engineering Society. From the *Journal of the Association of Engineering Societies*.

his sympathy for the men; but thereafter he avoided responsibility, knowing that he could not depend on the support of his directors. . . . Matters of detail took up the time of the board, and business was impossible. The plant kept on going from sheer inertia, but the engineer very early concluded that he should end his connection with the institution. He had been wiser for himself, I think, had he come to this conclusion a year sooner than he did; but he, like almost all engineers, was faithful to his salt and tried to do the best for his masters, the public, under adverse circumstances. He economized to a fault; he left his machinery in perfect condition and a surplus of over \$50,000 in the treasury. . . .

Unfortunately, the factional spirit survived. Employees and ex-employees who had given aid and comfort to the commissioners now dominating had to be taken care of, and these commissioners found themselves the representatives of a faction of the most impracticable kind. A general superintendent was chosen, but he is superintendent in name only. When appointed he did not know the elementary principles of electrical generation and distribution, and he thereby became dependent on one of the reappointed ex-employees, who was nominated as his assistant. In the public reports and specifications of the commission there is nothing to indicate that during the past year the general superintendent has learned any more about the electrical business than he knew when he started. I regret to say also that these reports and specifications indicate that not merely the general superintendent lacks essential knowledge, but that the assistant is far from having sufficient engineering ability to make good the deficiencies of his chief. It seems ridiculous that a plant which has sent a dozen smart electrical engineers to profitable employment elsewhere should not be able to find one able man to take intelligent charge of its own affairs. A private plant, offering the same salary, would have found such a man very promptly. . . .

The financial results do not clear the record. The past president started in with a remarkable programme of proposed economies. He announced that expenses could be reduced \$20,000 per annum. During the year of his control the expenses apparently have been increased to the tune of \$10,000 per annum, and for the first time in its history the commission comes before the Board of Estimators reporting that it will apparently have a deficit at the end of the current fiscal year. That result indicates that there was something wrong with the programme, and increases rather than decreases the evidence against the present system.

My conclusion is that a public works department can be operated efficiently and economically on the same lines as is the service of a private corporation; the commissioners, assuming the duties of the directorate of such a corporation and the general superintendent, who must be a thoroughly competent engineer, performing all the executive duties. I can admit no exception to this rule. I am aware that in some organizations the peculiar knowledge of individual directors makes their advice exceedingly valuable in the executive department. This was the case in the first Public Lighting Commission of the city of Detroit. . . .

I have indicated sufficiently the peculiar fitness of the first Lighting Commissioners of this city to take charge of detail and to perform the executive duties of their department, and yet it was these commissioners, who knew exactly what they were doing and who were, without exception, better fitted for their public work than any of their successors have ever been, who positively declined to depart from their legislative functions and who insisted upon the assumption by their general superintendent and engineer of the full responsibility and the full authority which his executive duties required. It has remained to men of less knowledge to initiate the contrary policy and to fail in it.

TECHNICAL.

Manufacturing and Business.

The Vulcan Iron Works, of Wilkesbarre, Pa., have placed the sale of their locomotives for the Chicago territory in the hands of Willis Shaw, 614 New York Life Building, Chicago.

Harrison dust guards were specified for use on more than 50,000 journals for new cars ordered by railroads in the United States and foreign countries during the month of January.

W. W. Bracy, formerly Chief Clerk to the Purchasing Agent of the Pere Marquette Railroad, has accepted a position as salesman with the General Manifold Company, of Franklin, Pa.

F. P. Collier, formerly Western representative of the Corning Brake Shoe Co., has resigned and been appointed General Sales Agent of the Consolidated Railway Lighting & Refrigerating Co., with headquarters in The Rookery Building, Chicago.

The Standard Construction Company of Indiana, of Lafayette, is incorporated with \$100,000 capital stock, to build railroads and railroad bridges. The Directors are Allen R. Jewett, Addison Bybee, Nicholas W. Box, Hiram Kerlin, Arthur A. McKain, Charles A. Meeker and Jacob F. Marks, of Lafayette and Indianapolis.

The Frost Wire Fence Co., Cleveland, Ohio, reports a rapid increase in its business. The active members of this company have been making wire fencing for the past 13 years. The Frost Wire Fence Co. was started in

Columbus, Ohio, in May, 1896, and it moved to Cleveland in June, 1897, its present factory being modern in all respects. A new catalogue has recently been issued showing the different styles of fence made for railroad rights-of-way.

The reorganization of the Cook Cooler Co., of Flint, Mich., has been effected. The new company is the Cook Car Journal Cooler Co., of Flint, and has a capital stock of \$100,000. The officers are: President, J. Dallas Dort; Vice-President, M. P. Cook; Treasurer, John J. Carton; Secretary, Joseph Crawford. The officers of the new company will push the business, a Chicago office being the first step decided upon. The Cook cooler is said to be in use on 18 railroads.

The American Air Compressor Works have been organized to make air compressors and compressed air tools and appliances, with a plant at Van Brunt and Summit streets, Brooklyn, N. Y. Wm. S. Fairhurst, Manager, and Frederick B. Vail, who will have charge of the sales department, were both identified with the Clayton Air Compressor Works, the interests in which, owned by James Clayton, were sold to the International Steam Pump Co. The office of the works will be in the Havemeyer Building, 26 Cortlandt street, New York City.

Iron and Steel.

E. E. Buchanan, Manager of the Elmira plants of the Empire Bridge Co., has resigned.

A large Southern railroad is about closing a contract with a foreign rail maker for 10,000 tons or more of rails for quick delivery.

John Stephens is now with the Midland Works of the Inland Steel Co., which company will build sheet mills at Indian Harbor, Ind.

The Manufacturing & Selling Co. of America was incorporated in New Jersey last Saturday, with a capital of \$500,000, to make and sell iron and steel.

A bill has been filed in the Chancery Court by a stockholder in the Alabama Steel & Wire Company, asking that the company be placed in the hands of a receiver, on the ground of mismanagement of its affairs.

The American Bridge Co. has a contract for an extension of the central power house of the Sydney City & Suburban Tramways, Sydney, Australia, which calls for 700 tons of structural material to be delivered inside of four months.

W. A. Cornelius, heretofore General Superintendent of the National Rolling Mill, Monongahela furnaces, steel works, and the Boston Iron & Steel Works, of the National Tube Co., in McKeesport, has been made Assistant General Manager of these plants.

The Midland Bridge Co., of Kansas City, Mo., is building all the bridges on the Vera Cruz & Pacific Ry., in Mexico, including the foundations. The contract amounts to about \$1,000,000. The work has been going on for a year, and it will be two years more before it is finished. The company is also building a combined railroad and wagon bridge across the Arkansas River at Muskogee, Ind. Ter. for the Muskogee City Bridge Co., to be used by the Muskogee & Western Ry. Outside of these the company has contracts amounting to about \$200,000.

Tube Works Break Records.

The National Tube Works at McKeesport broke all records in the tons turned out during January. The output of the various mills follows: Tube and pipe mills, 30,551 tons of finished pipe. The best previous record was 28,882 tons. National Rolling Mills, 24,458 tons, against a previous record of 22,670 tons; Boston Iron & Steel Works, 7,349 tons, against its previous output of 5,623 tons; blooming mill of the Monongahela furnace department, 26,918, against 23,770 tons; converting mill of the same department, 29,044 tons, against its previous record of 26,971 tons. The total output of the National Tube Works in McKeesport during the first month of the year was 118,320 tons of finished iron.

The Bremmer Arc Lamp.

The New York offices of the Westinghouse Electric & Mfg. Co. now contain some of the Bremmer arc lamps, a recent invention of Mr. Hugo Bremmer. The American patents are controlled by Mr. George Westinghouse. The lamp consists of a number of carbons, obliquely approaching one another, the arc burning between their lower ends and being held in position magnetically. The arc is in a cup-shaped chamber into which the ends of the carbons protrude, and the lamp casts no shadows under the arc. The cup being enameled with white forms a reflector. The carbons are made in short sections, a number of them being located in a magazine and automatically fed down, so that as one is burned another takes its place. The arc is struck by means of a carbon point on the end of a lever, which, when current is turned on the lamp is thrown over against the electrode points and immediately withdrawn, leaving the arc established. The mechanism for feeding is of the simplest clutch variety. The positive and negative carbons differ in size, the positive being the larger, and while the negative carbon is solid the positive is cored and filled with a mixture of carbon powder and metallic salts. Such substances as salts of calcium, magnesium, strontium, fluospar and glass are mentioned as appropriate for this purpose. A flux generally consisting of a fluoride is added to this mixture, this preventing the formation of hard cinders which might injuriously affect the burning of the lamp. The inventor states that

fluorine in particular, if added to the carbon compound in conjunction with twice its quantity of calcium salts, yields a pleasant yellowish light. The light is described as a magnificent golden white, resembling afternoon sunshine, and the burning of the lamp is said to be very steady.

Air Brake Cars at Nashville.

Air-brake cars cut out leaving Nashville Yard, Nashville, Chattanooga & St. Louis Ry., December, 1901:

Number of air-brake cars forwarded	7,454
Number of air-brake cars O. K.	7,457
Air-brake cars cut out	117
Average serviceable air-brake cars per train	14.5

Of the 117 cars cut out, there were:

Blowing at exhaust	25
Check valve case gasket blown out	8
Release valve leaking	6
Sand hole in triple valve body	1
Tube in auxiliary reservoir bursted	1
Drain plug broken off in auxiliary reservoir	2
Brake cylinder gasket blown out	4
Train pipe broken	2
Branch pipe broken	15
Flat wheels	37
Brake rigging out of order	16
Total	117

Of the 117 cars cut out, 104 belonged to railroad companies and 13 to private car lines. Of the air-brake cars forwarded, 6,148 were equipped with apparatus of the Westinghouse Air Brake Co., 1,422 with apparatus of the New York Air Brake Co., one with apparatus of the Landsberger air-brake, two with apparatus of the Boyden air-brake, one with apparatus of the Crane air-brake.

Air-brake cars cut out coming into Nashville yard, December, 1901:

Blowing at exhaust	48
Blowing at vent port	11
Triple valve needed cleaning	19
Sand hole in triple valve body	1
Triple valve and cylinder frozen	38
Check valve case gasket blown out	28
Release valve leaking	17
Tube in auxiliary reservoir bursted	1
Drain plug broken off auxiliary reservoir	9
Brake cylinder gasket blown out	5
Branch pipe and union leaking	24
Branch pipe broken	11
Train pipe leaking	5
Train pipe broken	2
Hose and angle cock gone	40
Flat wheels	19
Brake rigging out of order	19
Total	287
Cars leaving Nashville with brakes cut out	117

Cars repaired

170

A Big Electric Power Plant for Baltimore.

The United Railways & Electric Company, of Baltimore, has closed a contract with the Westinghouse Electric & Manufacturing Co. for four electric generators of 2,000 k.w., or about 2,800 h.p. each. The United Company is operating the old World's Fair Westinghouse machines which are rated at 750 h.p. each. These machines were among the noteworthy exhibits at the Chicago World's Fair, and at that time were the largest electric generators in the world. The new machines will generate three-phase alternating currents at 13,000 volts, and 3,000 alternations per minute. This current will be transmitted through light cables to sub-stations where it will be "stepped down" and converted to direct current at 550 volts for distribution through the trolley wires. The contract includes transformers, rotary converters, switchboards and all necessary auxiliary apparatus. This contract is one of a large number of sales of extraordinary size and importance which have recently been made by the Westinghouse Company. The eight 5,000 k.w. alternators for the Manhattan Railway Company, of New York, are the largest in the world. The contract for the equipment of the power house for the New York Rapid Transit subway was also unprecedented in size and the amount of money involved. The power house for the Underground Railways of London will also be equipped with Westinghouse machinery.

New Engine Company for Canada.

Despatches from Toronto, Canada, announce the incorporation of the John Abel Engine & Machine Co., with an authorized capital of \$1,000,000, and the following provisional directors: Hon. S. C. Wood, Robert Kilgour, Clarkson Jones, H. P. Dwight, Wilmot D. Matthews, William R. Brock, A. W. Holmsted, James Milne, Thomas A. Rowan, Samuel Barker and Edward Lyman Goold.

Car Inspectors.

The Master Car Builders' Association Committee on Code of Rules for Examination of Car Inspectors, sends out the following circular:

"If you have any instructions or rules in force on your line regarding the selection of men for car inspectors, will you kindly send copy of same to the undersigned for the information of the committee? The committee would also like to have a reply from you as to whether you have any special instructions in force regarding this matter. Please send your reply not later than March 15, 1902, to G. W. Rhodes, Chairman, Lincoln, Neb."

Compressed Air Cars, Chicago.

The bursting of the discharge pipe from the compressors in the power house of the Union Traction Co., North Clark St., Chicago, on the night of Jan. 31, injured two men and put the company's compressed air cars out of service temporarily. There are two high-pressure compressors in the rear of the power house and back of the cable machinery, which furnish air for the night service air-motor cars on North Clark street. The discharge pipe leads from the compressors to a receiver immersed in a tank of water and from there to six large storage bottles; from the bottles pipes pass to the street for

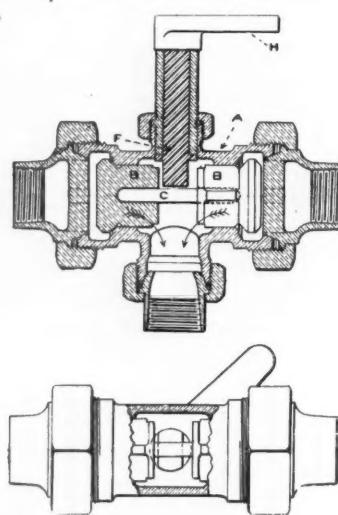
charging the reservoirs on the cars. The pipes from the compressor to the receiver are water-jacketed and have been tested to 4,000 lbs. The delivery pressure of the compressors is 2,400 lbs. with a maximum of 2,800 lbs. Just what caused the accident is not definitely known. A frequent cause of such explosions is the ignition, from the high temperature of compression, of a mixture of air with gas formed from the decomposition of cylinder oil which has found its way into the delivery pipe. It is thought that this may have caused the trouble in the present instance.

Chicago Track Elevation.

The City Council, Chicago, Feb. 3, passed an ordinance providing for the elevation of the tracks into the Union Stock Yards from the Michigan Central; Pittsburgh, Cincinnati, Chicago & St. Louis; Chicago Terminal; Chicago Junction and Grand Trunk. The ordinance provides for raising 30 miles of track and building 34 subways, the estimated cost being about \$2,000,000.

Lunkenheimer Locomotive Pattern Automatic Cylinder Cock.

The illustrations show sectional views of the Lunkenheimer locomotive pattern automatic cylinder cock, which is being used on some compound locomotives. This cock is very simple and is said to give good results. It consists of a valve casing *A* containing two wing valves *B B* connected together by a loose pin *C*. The valves *B B*



open and close alternately as steam is admitted and exhausted through the opposite ends of the cylinders, to which the inlets of the cock are connected. In this manner they are continually in operation and constantly relieving the cylinder of condensation. The stem *F* is arranged to be operated by a lever from the cab, so that by turning it to central position both valves *B B* are held off their seats and the condensation will drain out of both ends of the cylinder. The Lunkenheimer Company, Cincinnati, Ohio, will give full details upon application.

Consolidation of Railroad Spring Makers.

Negotiations are under way for a consolidation of the railroad car and locomotive spring manufacturers. It will be called the Railway Steel Spring Co., and is incorporated under the laws of New Jersey. The companies included are the A. French Spring Co., Pittsburgh, Pa.; the railroad spring business of the Anderson, Du Puy Co., controlled by the Crucible Steel Co. of America, Pittsburgh; National Spring Co., Oswego, N. Y.; Pickering Spring Co., Limited, Philadelphia; Charles Scott Spring Co., Philadelphia, and the Detroit Steel & Spring Co., Detroit, Mich. The capital stock of the consolidated company will be \$20,000,000, of which \$10,000,000 will be 7 per cent. cumulative preferred, the remainder being common stock. The plants of the new company will have an annual capacity of 60,000 tons. Officers have not been elected, but Jules E. French will be Chairman of the Board.

Fuel Oil on the Southern Pacific.

In our issue of Jan. 31 we gave information about extensive use of oil fuel on Southern Pacific locomotives in California. It is now reported from Portland, Ore., that the work of preparation has been arranged for as far north as Ashland, Ore., and that building large storage tanks will begin at once. Dunsmuir, Edgewood, Hornbrook and Ashland are each to have a tank, those at Dunsmuir and Ashland to be of 55,000 bbls. capacity. It is expected that the tanks will be ready for use about April 1.

Dismissal of a Brake Rigging Suit.

On Feb. 5 Judge Hallett, of the Circuit Court of the United States for the District of Colorado, formally dismissed the four suits of Weller against the Pennsylvania Railroad, the Pittsburgh, Fort Wayne & Chicago, the New York Central & Hudson River, and the Baltimore & Ohio. These suits were brought for infringement of patent No. 274,869, March 27, 1883, to Simon P. Weller and others for a brake rigging. The suits against the companies whose lines do not enter the State of Colorado were brought under the United States statute enacted March 3, 1897, providing that infringement suits might be brought against non-residents in districts in which they had established places of business and had committed acts of infringement. The Court held that the officers of these four companies, in

Denver, were not regular and established places of business contemplated by the statute, the agents being merely soliciting and advertising agents. The question whether or not the hauling of foreign cars by a Colorado railroad company would be an infringement in Colorado by the foreign railroad company the Court did not decide. It follows that all suits against the companies whose lines do not run into the State of Colorado will probably be brought in the United States Circuit Courts for the districts in which the companies are incorporated or into which their lines extend.

The Pneumatic Signal Company.

A press despatch from Albany, N. Y., Feb. 9, reports the incorporation of the Pneumatic Signal Company of Rochester, with a capital of \$3,000,000, to manufacture railroad and other signals. The directors are: John N. Beckley, George Weldon, G. W. Archer, Frederick Cook, O. H. Harris, E. C. Buell, T. L. Smyth, C. L. Palmer, J. H. McCartney, B. E. Chase, E. M. Upton, of Rochester; A. H. Renshaw of Troy, and W. L. Bull, of New York city. This means the dissolution of the organization, under the laws of another State, under which the Pneumatic company has heretofore been conducted; and the changes in the list of directors indicate the consummation of the purchase, by this company, of the Standard Signal Company of Troy.

THE SCRAP HEAP.

Notes.

The Chicago & Alton has appointed a chief photographer, who will not only attend, in his line, to the wants of the advertising department, but also will make photographs of engines, cars, signals and other things which will be useful in giving instruction to trainmen.

The Delaware, Lackawanna & Western is rapidly extending its telephone wires, and soon will have a metallic circuit of copper between New York and Elmira, 263 miles. From Elmira to Buffalo, 147 miles, a metallic circuit will be made of existing telegraph wires, to be used for telephone communication.

Out in California they do not have to wait until May to put their summer time-tables into effect. The Southern Pacific has put on an observation train to run every Sunday around the south side of San Francisco Bay. The train starts from Oakland at half-past eight in the morning, and runs through the most beautiful parts of the Santa Clara Valley. The train stops at San Jose from 10:50 to 1 o'clock; at Los Gatos, from 1:25 to 2 o'clock; at Santa Clara, from 3 o'clock to 3:40; and a stop will be made at Palo Alto. The train reaches San Francisco at 7:30 p. m.

Traffic Notes.

The Erie & Western Transportation Co., owned by the Pennsylvania Railroad, is to make important additions to its fleet of steamers on the lakes, and has let contracts for two large vessels. It is proposed to make the passenger business more important the coming summer than heretofore. One of the new steamers will be 340 ft. long, with three decks.

Mr. G. L. Thomas, formerly contracting freight agent of the Chicago, Burlington & Quincy, in Kansas City, has been appointed representative in New York City of ten large wholesale dry goods houses on the Missouri River. He will have control of the freight traffic of these merchants, so far as routing and rates are concerned. This combination includes five large firms in Kansas City, three in St. Joseph and two in Omaha.

A bill has been introduced in the Iowa Legislature providing that the law permitting towns to aid steam railroads shall be extended to electric roads. If it passes a 5 per cent. tax may be voted by any town to aid any railroad company, electric or other. Another bill provides that railroads may grant special rates on coal and raw materials for manufacturing industries in carload lots, the rates to be first approved by the railroad commissioners.

Passenger Traffic Manager S. F. B. Morse, of the Southern Pacific, has begun a campaign to educate the people of the country on the merits and cheapness of rice as a food, and the wealth producing possibilities of rice culture. He says it is the "agricultural marvel of the age." Only 350,000 acres in Texas and Louisiana are now in rice cultivation, out of a possible 3,000,000 acres. The annual consumption of rice in the United States is 300 to 350 million pounds. The production last year was 278,000,000 lbs., about 80,000,000 lbs. being imported. Mr. Morse hopes to make this a rice exporting, instead of importing nation. Mr. Morse has begun his campaign with cook books for free distribution, 60,000 of which have already been given away.

Shippers are beginning to complain of the large-capacity cars which are now coming into general use. The railroads have at last increased the minimum weight to be charged for carrying carload freight in cars of large capacity enough so that the shipper who sells single carload lots, finds his business disturbed. One such shipper says: Within 10 years 100 bbls. of flour made a carload. Next it took 120 bbls., and at the present day it takes 150. Next it will be 200. Every dealer knows how difficult it is, and has been, to sell 20,000 lbs. to certain classes of merchants. If the minimum is increased to 40,000 lbs. it will simply mean the selling of small lots only to 75 per cent. of the retailers, and a comparative increase of cost to the consumer because of the increased cost of transportation. A wholesale hardware dealer says: "Such a rule would be a burden on the small shipper and in some cases would prevent him from doing business. In the matter of nails, for instance, 30,000 lbs. is as much as many people care to buy at one time, and it will be a serious embarrassment to be forced to take 40,000 lbs. in order to get carload rates."

Puget Sound Coaling Station.

Plans and specifications for the new coaling station to be built by the Government at the Puget Sound Navy Yard are with the Secretary of the Seattle Chamber of Commerce. An appropriation of \$128,000 has been made

by the Government for this coaling station and for dredging. The wharf, according to specifications, will be 350 ft. long. There will be two slips, and the coal is to be placed in inclined elevated bunkers, with telescopic chutes. The capacity of the bunkers is to be 1,750 tons. Behind the bunkers will be storage sheds, with a capacity of 15,000 tons. The bunkers will hold enough coal to load one vessel. These bunkers will be filled from the storage sheds by cars and electric cableways. By use of the telescopic chutes 250 tons an hour can be handled for each vessel, but until a further appropriation is obtained facilities will be furnished for loading only one vessel at a time.

Getting Trains Over the Road.

The following paragraph is from a short paper presented by Mr. Eugene McAuliffe (St. Louis & San Francisco) at the January meeting of the St. Louis Railway Club: "I will close with a brief explanation of my idea of field organization, viz., men who are not afraid of work; who, confined to short districts, will ride each engine in turn, meet a certain number of men each day; who know when an engine is pulling her limit, when the limit is exceeded; who kindly instruct the apprentice and his master alike; who, when the engineer shifts his burden on the trainman, can go to that man and hear his side, go from thence to the yardmaster, the agent at outside points, the air inspector, or any other individual in the operating department who may be concerned. This man, during dull seasons, should gather about him classes of engine and trainmen for instruction on train movements, locomotive, and air-brake practice, and, what is not less important, the extension of acquaintance that means much for good. At this season he could also do much toward looking up material from which to recruit his forces. With such a staff superintendents would have much of small detail taken from their shoulders, giving more time for the consideration of questions of greater moment. With wages now fixed at what can be called a fair standard, good thoughtful men could often head off the 'grief committees.' Years ago we looked on an engine failure as an accident, we now consider it but an incident, a passing one at that: they come too quickly to linger over them, but withal they do not make a road pay."

New Army Small Arm.

Gen. Crozier, Chief of Ordnance, U. S. A., has given orders for 5,000 rifles of the new pattern for distribution to the army, as the first of the gradual retirement of the Krag-Jorgensen rifle which is to be replaced by the new arm. The new rifle has a muzzle velocity of 2,300 ft., and can be used either as a single-loader or with the magazine.

Dosing Locomotives with Muriatic Acid.

The *Atlanta Constitution* gives an account of the trial of F. B. Ellis on a serious charge, and the following is quoted from that paper:

"F. B. Ellis, the machinist charged with 'doping' two engines of the Southern railroad with muriatic acid, was convicted before Judge John S. Candler, in the Criminal Superior Court, and was sentenced to a term of five years in the penitentiary. Ellis is a young man, of general neat appearance. It was shown in the evidence that he had come to Atlanta from Memphis and that he had previously been in South Dakota and other places. The trial developed a sensation in regard to the machinists' strike on the Southern. The prosecution introduced evidence to prove that Ellis had made the statement that he was paid by the strikers to disable engines of the Southern road. He is charged with having administered muriatic acid to engines No. 13 and No. 387 in this city. The defense rested with the statement of the defendant, in which he denied that he was working in conjunction with the strikers. The State presented testimony to show that Ellis had made a confession, and also to prove that he was caught on an engine with the muriatic acid in his pocket, underneath his overalls. It was also shown that the two engines had been tampered with. Ellis came to Atlanta and procured employment as a machinist at the Southern shops, after the machinists went on a strike. Some time ago it was ascertained that two engines had been doped and Ellis was arrested. The count on which the conviction was made charged Ellis with wilfully and maliciously injuring engines of the Southern railroad."

War Ships Building.

The Navy Register, just issued, and dated Jan. 1, 1902, shows the following ships now under construction: First-class battleships, eight; armored cruisers, six; protected cruisers, nine; monitors, four; gunboat, one; torpedo-boat destroyers, nine; torpedo-boats, seven, or a total of 59 ships building. The ships in commission and ready for service include 10 battleships, two armored cruisers, 14 protected cruisers, 27 torpedo boats and 68 gunboats, beside 15 colliers, and supply, tank, hospital and distilling ships, tugs and old ships and monitors.

The Grand Trunk at the Sportsmen's Show.

The Grand Trunk has completed arrangements for an extensive exhibition in connection with the second annual Sportsmen's Show to be held in Chicago from Feb. 3 to Feb. 22. The Grand Trunk exhibit will include the collection of large photographs of scenes throughout the summer resort districts situated on its line, including the Muskoka Lakes, Lake of Bays, Magnetawan River, 30,000 Islands of the Georgian Bay, Kawartha Lakes, and Lakes Simcoe and Couchiching, as well as views on the Portland division, combining land and water scenes, scenes in the White Mountains, and surf bathing scenes taken on the Maine seacoast. The space occupied will be about 4,000 sq. ft. In addition to their pictures, several stuffed fish of species that inhabit the Canadian waters will also be included, as well as wild animals.

To Move the Ames Monument.

It has been decided by the Union Pacific Railroad that the Ames monument, which has been left isolated at the old Sherman station by the construction of the Sherman Hill tunnel and the Laramie-Bufford cut-off, shall be moved to the new Sherman station, four miles south of the former site. The proposition to rebuild it elsewhere than on the Sherman Hill was decided to be wholly opposed to the spirit that originally led to its erection. The Ames monument, which was built in 1883, and paid for by relatives of Oakes and Oliver Ames, is of native granite and cost \$100,000.

The Cost of Common Decency.

It will cost the Illinois Central a large amount annually in freights for having told a passenger last night to put on his shoes. R. H. Read, a wealthy drover of Logan, Iowa, removed one of his shoes in the chair car of the fast Omaha train. The portér came along and told him that he must put on his shoe or go into the smoking compartment. Read complied, but appealed to

the conductor, who sustained the porter. Read had steadily used the North Western but the local Illinois Central agent induced him to change, but now he declares he will never ship another pound over the road, and William Johnson, of Dunlap, a fellow shipper, says he, too, will use other lines. Read was one of the best dressed passengers in the car. He wore a pair of varicolored shoes and polka dot hose, and carried in his vest \$2,800, the proceeds of two cars of cattle.—*Springfield (Ill.) News.*

Oil Fuel Tanks in Texas.

The Gulf, Colorado & Santa Fe has completed nine oil storage tanks, each with a capacity of 37,000 bbls., and work is in progress on two more tanks of the same capacity. These tanks are at various points on the company's lines in Texas, and are used for storing oil for use as required for fuel in the locomotives.

Freight Traffic Between the United States and Mexico.

The statistics of the Mexican Government show that during the fiscal year ending June 30, 1901, the number of freight cars which crossed the Rio Grande at the various frontier points, from the United States into Mexico, was 38,629, carrying 536,640 tons of freight, and that the number of cars which crossed from Mexico into the United States during the same period was 20,368, carrying 223,720 tons of freight.

Car Transfer at Duluth.

The U. S. Senate, on Jan. 29, passed the bill which passed the House of Representatives some days ago, authorizing the City of Duluth to build and maintain a car transfer across the Duluth Canal and to occupy certain lands of the United States by part of the structure.

Tests for Smoke in the Tunnel.

At the hearing which was held by the State Railroad Commissioners in New York, for the investigation of the Fourth Avenue Tunnel, Prof. Wm. P. Mason, of the Rensselaer Polytechnic Institute, a chemist of long experience, gave some testimony concerning the atmosphere in the tunnel, which testimony was not fully given in the minutes from which we made up our report, published last week. Prof. Mason rode through the tunnel on the engines and in the cars a number of times on Jan. 27 and 28, the 27th being misty and foggy. He tested for smoke by exposing from the sides of moving trains large, white porcelain dishes which had been smeared with glycerine. On a surface of this kind, smoke will be retained and show lines easily visible to the eye. No indication of smoke was found, the only particles adhering to the dishes being coarse material which had probably come off from the locomotive stack or from the coal pile on the tender. Other experiments were made with glycerine hardened with gelatine, alternating strips of the surface being covered with paper; but still there was no evidence of smoke. Experiments were also made on the front of a moving locomotive, so as to catch nothing from the engine on which the experimenter was riding. The substance of the professor's testimony was that all of the engines which he could examine in two days were burning either coke or anthracite coal, so that practically no smoke was emitted. It was observed that when an engine, working full steam, passed under a bridge, the steam forced downward by the bridge appeared as a dark cloud; so dark that a careless observer would call it smoke; but as soon as it drifted away from the shadow of the bridge the steam at once took on its characteristic white appearance.

Northern Pacific Improvements at Duluth.

The Northern Pacific is building a new 36-stall roundhouse, a small shop and store room and a small freight car repair shop, together with a power and heating plant, at Duluth, Minn. In addition to these improvements, extensive additions are being made to the yards and docks.

Street's Stable-Car Company.

Street's Western Stable-Car Line, of Chicago, is to acquire the entire business and property of the Consolidated Cattle Car Company, and Canda Car Company. These companies own some 5,000 cars, which, added to those already belonging to the Street company, will give the latter over 9,000 cars, or nearly a monopoly of the private cattle-car line business in the United States.

Report of Industrial Commission.

The Industrial Commission has submitted to Congress its final report of about 1,000 pages. On the subject of transportation the Commission recommends that additional authority be given to the Interstate Commerce Commission, practically as contemplated in the Cullom bill, except that uniform classification of freight is not included. It is also recommended that the Interstate Commerce Commission have a corps of auditors to examine the accounts of all railroad companies. It is recommended that other States adopt the Massachusetts Anti-Stock-watering law, and that railroads should be forbidden to make lower rates on freight imported from foreign countries than on shipments originating at the seaboard.

Revision of Rules of Interchange.

The following committee of the Central Railway Club has been appointed to report recommendations relative to a revision of the Rules of Interchange for the consideration of the Arbitration Committee of the M. C. B. Association at their meeting in April: J. A. Bradley, Foreman, N. Y. C. & H. R. R., Buffalo, Chairman; G. W. Seidel, M. M., N. Y. C. & St. L. R. R., Buffalo; and James B. Martin, Clerk to Arbitrator, Buffalo.

The Brooklyn Bridge Crowd.

As a result of a bad crush at the trolley loops at the Manhattan end of the Brooklyn Bridge about 6:10 o'clock yesterday evening (Feb. 5), one young man is in the Hudson Street Hospital suffering from a compound fracture of the right leg and fracture of the thigh. Several other persons were badly bruised in the crush. It happened just when the rush of persons to their Brooklyn homes was heaviest. The young man who was hurt was Charles Jacob, nineteen years old, of 59 Central avenue, Brooklyn.—*N. Y. Sun.*

The Master Mechanics' Association Scholarship.

The next vacancy in the scholarships of this Association at the Stevens Institute of Technology will occur in June, 1902. The requirements of the constitution regarding candidates are as follows:

"Acceptable candidates for the scholarship shall be, first sons of members or of deceased members of the Association. If there is not a sufficient number of such applicants for the June examinations, then applications will be received from other railroad employees or the sons of other railroad employees for the fall examination. In extending the privilege outside of the families of members, preference shall be given to employees, or the sons of employees, or the sons of deceased employees of the mechanical departments. Candidates for these scholarships shall apply to the secretary of this

association, and if found eligible, shall be given a certificate to that effect for presentation to the school authorities. This will entitle the candidate to attend the preliminary examination. If more than one candidate passes the preliminary examination, the applicant passing the highest examination shall be entitled to the scholarship, the school authorities settling the question. The successful candidate shall be required to take the course of mechanical engineering."

A scholarship confers the privilege of attending the entire course of the Institute for four years, free of all charge for tuition, provided the student holding the scholarship keeps up in all cases with the standard of proficiency and good conduct required. Entrance examinations will be held at the Institute from June 17 to 21, 1902.

Railroad Terminals for St. Louis Fair.

The Wabash Railroad has a lease of five acres of land west of De Balliviere avenue and north of Lindell Boulevard, St. Louis, Mo., upon which will be built passenger terminals for the Wabash System, for use during the St. Louis Fair in 1903. The station, which will be built about 200 ft. from the main entrance of the exposition, will be a handsome structure, costing \$50,000 and will also be elevated, with platforms and waiting rooms beneath. There will be about two miles of track. In addition to this arrangement for handling passengers, the Wabash has also completed arrangements to handle its share of freight. A right of way, 30 ft. wide, leading from the new passenger station to Skinner road, has been acquired, which will enable the company to connect with the tracks, which are to be laid in the site under the supervision of the World's Fair Co.

The Pennsylvania Railroad Bridge at Washington.

Mr. D. H. Burnham, of Chicago, a member of the Washington Park Commission, has written a letter to the Secretary of War regarding the proposed new railroad bridge to be built by the Pennsylvania Railroad over the Potomac River, for which plans were some time ago submitted to the Secretary of War. In his letter Mr. Burnham explains that a stone bridge is not possible because of the necessity for a draw, while a bridge of stone arches broken in upon by a steel truss would not look well, and that a bridge built of stone piers with steel trusses resting upon them is the best type. Mr. Burnham says while the draw might be on the bascule principle, it is considered unsafe for heavy railroad traffic, and that the design made by the Chief Engineer of the P. R. R. while constructively satisfactory will look better if the top chords of the trusses be apparently continuous, and he recommends that if this be done the plans be approved. Mr. Burnham does not favor any structure at the ends of the bridge on shore, and says that there is no better treatment for the stone piers than the one devised. His conclusion is that the simpler this bridge is the better it will appear, the lines of the steel being kept apparently continuous.

The R. P. I. Alumni.

The twenty-fourth annual midwinter reunion of graduates of the Rensselaer Polytechnic Institute was held in New York City at Sherry's, Friday, Feb. 7, 7:30 p. m. The attendance was probably the largest of any of the reunions yet held. Mr. Charles Macdonald presided in the necessary absence of Mr. Horace G. Young, President of the Alumni Association. Among the guests were: President Ricketts, of the Institute; Dr. Rainford, rector of St. George's, in New York City; Judge Ransom, of New York; George H. Pegram, H. G. Prout, John C. Kafer, and Mr. Lindenthal, the Commissioner of Bridges:

LOCOMOTIVE BUILDING.

Johnson & Co. are having five locomotives built at Baldwin's.

The Louisiana & Arkansas is having two locomotives built at the Baldwin works.

The Spanish-American Iron Co. is having a locomotive built at the Baldwin works.

The Chicago Great Western is having 32 locomotives, out of its recent order, built at the Rhode Island Works.

The Portland & Rumford Falls has ordered two 80-ton locomotives from the American Locomotive Co., Manchester works.

CAR BUILDING.

The Pullman Co. is building 20 coaches for its general service.

The Rutland has ordered 20 passenger cars from the Pullman Co.

The Great Northern has ordered 300 steel cars from the Cambria Steel Co.

The Wallace Circus Co. is building two freight cars at the Illinois Car & Equipment Co.

The American Sheet Steel Co. order reported last week should have been credited to the Pressed Steel Car Co.

The Pittsburgh Plate Glass Co. order reported last week should have been credited to the Pressed Steel Car Co.

The Bangor & Aroostook is having 200 freights built at the Bloomsburg works of the American Car & Foundry Co.

The Alabama Great Southern is having two coaches built by the American Car & Foundry Co. at Jeffersonville, Ind.

The Mexican National is reported to have ordered 20 passenger cars from the American Car & Foundry Co., in addition to recent orders.

The Vandalia order for passenger cars reported Feb. 7 calls for 16 coaches and five combination passenger and baggage cars. To be 70 ft. over end sills.

The Buffalo, Rochester & Pittsburgh has ordered 50 standard 34-ft., 40-ton convertible ballast and flat bottom gondolas from the Rodger Ballast Car Co.

The West Virginia Central & Pittsburgh has ordered 800 hopper bottom coal and ore cars. Vanderbilt design, from the Cambria Steel Co. Capacity, 110,000 lbs. coal or 120,000 lbs. ore. Dimensions, inside measurement, length, 30 ft.; width, 8 ft. 6 in. Height, 10 ft. 7 1/2 in. from top of rail to top of side.

The Norfolk & Western orders for freight cars reported Jan. 10 and 17 call for 2,000 gondolas with drop doors, 85,000 lbs. capacity. Length, 33 ft.; width, 8 ft.

9 1/2 in.; height, 4 ft. 6 in. Cars to have steel under and side frames, with wood floors, sides and ends. N. & W. bolsters, Westinghouse brakes, Phosphor Bronze brasses, Chicago Steel couplers, N. & W. draft rigging and Pressed Steel journal box lids.

BRIDGE BUILDING.

ACTON, MASS.—An overhead bridge is proposed in South Acton.

CAMBRIDGE, MD.—The Commissioners of Dorchester County will build a draw bridge over Blackwater River.

BEAVER, PA.—The following capitalists of the Beaver Valley have agreed to charter for a bridge across the Ohio River from Beaver to Monaca: Henry C. Fry, Sr., Joseph A. West, H. W. Klein, William H. Beech and J. F. Peffer.

BIRMINGHAM, ALA.—The City Council has ordered the Southern Railway to build a bridge over its tracks at Twelfth avenue, North.

BOSTON, MASS.—The Boston Chamber of Commerce has appointed a committee to consider the advisability of erecting a bridge, to be known as Northern avenue bridge, across Fort Point Channel, in a location which would bring the city proper into much closer connection with the docks on that side of the harbor.

BRAINARD, MINN.—F. W. Cappelen, of Minneapolis, it is said, will make plans, etc., for a bridge at Brainard.

BROKEN BOW, NEB.—The Custer County Commissioners are advertising for bids for some bridge work. Geo. Dewey, County Clerk.

BUFFALO, N. Y.—State Engineer Edward A. Bond writes us that contracts have been placed for nearly all bridge work for which appropriations have been made, there remaining at the present time only the Ferry street bridge over Black Rock Harbor, at Buffalo, a swing bridge about 132 ft. long, and the Plymouth avenue bridge over the Erie Canal at Rochester, a lift bridge about 103 ft. long. These contracts will be awarded soon.

CARLISLE, MO.—Bids will be advertised, about March 1, for eight county bridges, 50 ft. each, to cross the canal and Little River. E. C. Randolph, Engineer.

CEDAR RAPIDS, IOWA.—The contract for the A avenue viaduct will be let in about a week, according to report.

CHATTANOOGA, TENN.—The Cincinnati Southern, according to report, will build a bridge over Tennessee River, near Chattanooga.

CHICAGO, ILL.—Bids are wanted, until March 6, for 21 steel bridges over the Illinois & Mississippi Canal. Major J. H. Willard, U. S. A., Engineer, Chicago.

CLEVELAND, OHIO.—The City Engineer has been ordered to confer with the State Board of Public Works, Chas. E. Perkins, Chief Engineer, in regard to lengthening the Canal bridges in this city. The plans and specifications of the Marshall street bridge did not meet with the approval of the State Board of Public Works.

COLUMBUS, GA.—Robert L. Johnson, Engineer for the new bridge to be built over Chattahoochee River, at 14th street, writes us that it is probable that the contract will be let about March 1.

COLUMBUS, OHIO.—A viaduct is proposed at Cleveland avenue. The city, the county and the Pittsburgh, Cincinnati, Chicago & St. Louis Ry. are interested.

CROOKSTON, MINN.—The County Commissioners have authorized three new steel bridges, one each at Crookston, Mallory and East Grand Forks. The contract for the bridge at Mallory was let to the Minneapolis Iron & Bridge Company.

The Commissioners have appropriated \$2,500 toward the cost of the \$10,000 bridge proposed over Red Lake River at Main street.

DANVILLE, ILL.—The contract for the double arch concrete bridge over North Branch for the Peoria & Eastern has been let to Yawger & Bettefeld, of Indianapolis, Ind.

DECATUR, ALA.—The Morgan County Commissioners have in contemplation a steel bridge at Falkville.

DELILH, N. Y.—Delaware County will spend \$20,000 on repairing roads and bridges this year.

DES MOINES, IOWA.—A committee has been appointed to determine on a site for a bridge over the Des Moines River at Thompson's Bend.

FINDLAY, OHIO.—Bids will soon be wanted by S. P. De Wolf, County Auditor, so that the contract can be let about April 1, for a girder bridge of two 85-ft. spans over Blanchard River, on Cory street. The foundations are being built by Norris & Renwick, of Findlay. E. C. Bolton, County Surveyor.

FORT DODGE, IOWA.—The Bates & Rogers Construction Company, of Chicago, has secured the contract for all of the bridge and culvert construction on the Chicago Great Western. (See Dec. 19, 1901, p. 882.) This firm is already at work on the Great Western bridge across the Des Moines River at Fort Dodge. The new contract includes the sub-structures of a number of overhead crossings and small bridges, no very heavy bridge work being necessary on the line after the Des Moines River is crossed.

FREMONT, OHIO.—The Board of County Commissioners are considering building a bridge over Sandusky River.

GENEVA, N. Y.—The Board of Public Works is considering building two bridges over Marsh Creek. The locations are Middle street and Andes avenue.

GRAY'S POINT, MO.—The plans for a bridge over the Mississippi River, near Gray's Point, for the Southern Illinois & Missouri Bridge Co., have been approved by the Secretary of War and work has already begun. The plans are not yet finished, but the bridge will consist of five large spans, one channel span of 650 ft. in the clear, three spans of 500 ft. each in the clear and one span 300 ft. in the clear. Besides these, there will be about 600 ft. of concrete arches in the west approach and 500 ft. in the east approach. The structure will be double track, and designed to carry the heaviest present loading. It is the intention to have it finished in two years. Alfred Noble and Ralph Modjeski, 1742 Monadnock Block, Chicago, Ill., have been appointed Chief Engineers, jointly.

GREENVILLE, S. C.—Bids are wanted, March 5, according to report, for a bridge over Reedy River. Address J. E. Speegle.

HAMILTON, ONT.—The Board of Works is considering

who shall pay for a bridge over the Northern Railway on Strachan street, viz., the city or the Grand Trunk Ry.

HARTFORD, CONN.—Plans are now under consideration for the proposed bridge over the Connecticut. At a meeting of the various committees last Saturday Engineer Graves explained three plans for a bridge and three for its Hartford approach. The stone arch bridge contemplated will cost approximately \$1,600,000; the steel arch bridge, \$880,000, and the steel girder bridge \$780,000. The plans for the approaches are known as the "eliminating," "Morgan street" and "compromise" plans, and their approximate costs will be respectively, \$1,357,500, \$928,425 and \$708,400. The compromise plan seems to be most favorable with the people.

KEWAUNEE, WIS.—The County Supervisors are considering building two bridges over Kewaunee River. Jos. F. Valecka, County Clerk.

LANSING, MICH.—The following are the bids opened, Jan. 27, for the Washington street bridge: American Bridge Co., \$39,900; King Bridge Co., \$40,790; National Bridge Co., New York, \$35,000; Stinson & Bloom (concrete and steel), \$31,000.

LITTLE FALLS, MINN.—Bids are wanted, on Feb. 15, for the 500-ft. plate girder bridge over Mississippi River. Estimate, \$45,000. Fred Cary, City Clerk.

LONDON, ONT.—A committee of the County Council has been appointed to award the contract for the Muncey bridge. (Jan. 10, p. 29.)

MIDDLETOWN, OHIO.—J. S. Roney, Superintendent Middletown & Cincinnati R. R., wants bids, with plans, etc., as soon as possible for a bridge about 100 ft. long over Miami & Erie Canal. Bridge to be either a swing or lift bridge, and cross the canal on about 21 deg. angle.

NEW CARLISLE, OHIO.—The Peoria & Eastern Ry. will place two 65-ft. through girder spans over Honey Creek to replace the present bridge.

NEW WESTMINSTER, B. C.—The Dominion Bridge Co. is said to have been awarded the contract for the superstructure of the large bridge over Fraser River at New Westminster, at about \$411,000.

OAKLAND, MD.—A bridge to cost about \$4,000 will be built over the north branch of Potomac River between Garrett County, Md., and Mineral County, W. Va.

OTTAWA, ONT.—The ratepayers of Rochesterville will present a petition to the Minister of Railways and Canals asking that a steel bridge be constructed across the canal at Concession street.

PARKVILLE, MO.—A bill was introduced in the U. S. Senate, on Feb. 4, and referred to the Committee on Commerce, authorizing a bridge across the Missouri River at or near Parkville, Mo.

PITTSBURGH, PA.—The contract for the steel work for the Lincoln avenue bridge has been awarded to the American Bridge Co. at \$700,000 and the masonry to Cronin & O'Herron at \$73,000. The paving and filling of approaches will be let later.

Bids are wanted, Feb. 24, by the Department of Public Works for the removal of the present iron approaches and the rebuilding of the sub-structure of the South Tenth street bridge across the Monongahela River.

QUINCY, MASS.—Bids are wanted, Feb. 18, by the County Commissioners at Dedham, for the highway bridge over Weymouth Fore River. It has a draw span of 270 ft. Plans, etc., were made by Hildreth & Co., Engineers, 32 Broadway, New York.

REDICKVILLE, ONT.—Bids are wanted by John S. Allen, Commissioner for Dufferin County, for a bridge over the Grand River in Proton.

RENSSELAER, N. Y.—It is said that the Greenbush Bridge Company is thinking seriously of raising the structure some 4 ft. higher than it is at present. Estimated cost, \$25,000.

ROCHESTER, N. Y.—See Buffalo, N. Y., above.

RUMFORD FALLS, ME.—Bids are wanted, Feb. 28, by H. C. Danton, for the highway bridge over Swift River. Chas. A. Mixer, City Engineer.

ST. JOHN, N. B.—The City Council is considering the question of building a steel bridge across the harbor. The cost would be about \$500,000 and would be borne by the Canadian Pacific Railway, the St. John Street Railway Co., and the city.

SANDUSKY, OHIO.—The Lake Shore & Michigan Southern will build a draw bridge over Cove Channel, replacing the present structure.

SAULT STE. MARIE, ONT.—The Sault Ste. Marie Bridge Company has been incorporated, with the object of building an international bridge across the St. Mary's River at this place.

SOUTH AFRICA.—Reports state that a bridge 400 ft. high and 600 ft. long will be built over the Zambesi for the Cape-to-Cairo Ry. Sir Douglas Fox, 28 Victoria street, Westminster, London, is the Engineer.

SOUTH MCALISTER, IND. T.—The Canadian, Eufaula & Gaines Bridge Co. has been formed to build bridges over the Canadian and Gaines Rivers. John Findley and G. M. Porter are interested.

SPRINGFIELD, MASS.—It is reported that the New York, New Haven & Hartford is preparing plans for a new bridge on South street, and that plans are also being made for a passenger depot and freight house at that point.

SPRINGFIELD, VT.—We are told that the Springfield Electric Ry. has proposed uniting with the town in building a bridge, 115 ft. long and 30 ft. wide. If the town approves the proposition, the contract will be let.

TORONTO, ONT.—The City Engineer, in his report to the Board of Works, last week, submitted a plan for an overhead bridge at the foot of Yonge street, which he estimates will cost \$195,000.

A \$2,000 bridge is proposed over west branch of the Humber River, south of Clairville.

VANCOUVER, B. C.—During the summer the Canadian Pacific Railway will build a steel bridge over the Kooteany River and numerous small bridges in the Slocan and Boundary districts in British Columbia.

VINCENNES, IND.—The County Commissioners will issue bonds for \$20,000 to build bridges in Knox County.

WASHINGTON.—The U. S. Senate, on Feb. 7, passed a bill authorizing the Washington & Oregon Ry. to build a bridge across the Columbia River, in the State of Washington, the plans to be approved by the Secretary of War, and Congress reserving the right to have the

bridge removed by the railroad company whenever the public interests may require it.

WILKESBARRE, PA.—The Lehigh Valley R. R. will build a bridge at Scott street.

WILLIAMSPORT, PA.—Viewers have recommended that the two bridges petitioned for by Lycoming County be built of steel and paid for by the State. The estimated cost of the bridge over the Loyalsock Creek, at Barrbour's Mills, is \$15,000; and that of the Lycoming Creek bridge, at Bodines, \$13,800.

WINSLOW, ME.—Contract will be let, Feb. 25, for the steel bridge over Sebasticook River. Estimate, \$10,000. C. E. Warren has charge of the work. J. W. Bassett, Town Clerk.

YORK, NEB.—Bids are wanted, Feb. 25, by the County Clerk, for considerable bridge work in York County. C. C. Boslaw, Clerk.

Other Structures.

ATLANTIC CITY, N. J.—The Delaware River & Atlantic (Electric) Railroad will build a terminal station and power house in Atlantic City.

AUGUSTA, GA.—We are told that bids will be asked on the new Union Station at Augusta, within 30 days. Frank P. Milburn, Columbia, S. C., Architect.

BROOKLYN, N. Y.—Capitalists have bought the water front from Forty-second to Fiftieth streets, Brooklyn, and will build a large freight station. Irving T. Brush is interested.

CAMDEN, N. J.—The Pennsylvania has let the contract for the power house which is to supply heat, light and power for the Camden Terminal Station. It will be a two-story brick building, 131 x 87 ft., the builders being the J. S. Rogers Company, of Stanwick, N. J.

CHARLESTON, W. VA.—The contract for the new Chesapeake & Ohio freight depot, which is to be built in Charleston, W. Va., has been awarded to A. F. Withrow & Co. of that city. The cost of the building, which is to be of brick and 400 x 325 ft., will be in the neighborhood of \$25,000.

CLEVELAND, OHIO.—The National Steel & Wire Co., according to report, has completed plans for a modern structural and bridge shop. The new building will be two stories high and will be 75 x 50 ft. The framework is to be of steel.

COLUMBUS, OHIO.—R. S. Warner, of this city, who has been identified with various iron and steel enterprises, is at the head of a movement to establish a steel casting foundry, plate, bar and angle mill, blast furnace and a pottery in Cleveland.

HORTON, KAN.—Fire partly destroyed the car works of the Chicago, Rock Island & Pacific, at Horton, on Feb. 7.

JERSEY CITY, N. J.—The Lehigh Valley freight station, pier and bulkheads at the foot of Van Vorst street, Jersey City, were burned on Feb. 9. Loss, about \$250,000.

JOHNSTOWN, PA.—It is probable that the Cambria Steel Co. will build an additional blast furnace in order to keep up with the steel-making capacity of the plant.

LIMA, OHIO.—The Lima Locomotive & Machine Co. has let a contract to the Champion Iron Co., of Kenton, Ohio, for its new machine and boiler shops, which will be 220 x 120 ft., and 140 x 120 ft. The contract for the electric work was given to the Sprague Electric Co., Paterson, N. J.

MINNEAPOLIS, MINN.—The Twin City Rapid Transit Co. will build new power houses in Minneapolis and St. Paul. Contracts for machinery are about to be let.

NEW CASTLE, PA.—The Pennsylvania Engineering Company of this city is about to build a large extension to its plant, which will double its size. Last fall the capital stock of the concern was increased from \$150,000 to \$225,000 for this purpose and now the stockholders are contemplating increasing it to \$500,000 in order to make still greater extensions than were at first planned.

NEW YORK, N. Y.—The U. S. Senate, on Feb. 6, passed the bill appropriating \$2,500,000 for a new Post Office Building in New York City. The selection of the site will be made by the Secretary of the Treasury, the Postmaster General, the Postmaster of New York City, the President of the Chamber of Commerce of New York, and the President of the New York Board of Trade and Transportation, who are constituted a commission for the purpose.

PATERSON, N. J.—The car barns of the Jersey City, Hoboken & Paterson Street Railway, and a large number of cars, were destroyed in the big fire in Paterson last Sunday.

ST. LOUIS, MO.—The World's Fair Grounds & Buildings Committee has let the contract for the Varied Industries Building to the Roundtree Construction Co., at \$630,000. This structure is to be one of the most important of the Exposition. The next lowest bid was \$660,000, submitted by Dunnavant & Estes, both St. Louis firms.

SPRINGFIELD, MASS.—See "Bridge Building."

SPRINGFIELD, OHIO.—The Great East Street reaper shops built by William N. Whitley, at a cost of \$2,000,000, were burned Feb. 10. The shops were occupied by the Springfield Foundry Company, Progress Stove & Furnace Company, Indianapolis Frog & Switch Company, Kyle Art Glass Company, Krell French Piano Company, Miller Gas Engine Company, Champion Chemical Company, and Owens Machine Tool Company.

TOLEDO, OHIO.—The Toledo Furnace Co., composed of H. H. McKeehan, Gustave Von Den Steinen, W. B. Stewart, G. W. Cotterill and R. H. Crowell, all of Cleveland, will build a blast furnace in Toledo. The capital stock is \$1,000,000.

WASHINGTON, D. C.—A bill has been introduced in the House of Representatives by Mr. Mercer, Chairman of the Committee on Public Buildings and Grounds, providing for the appointment of a Commission to select a site for a Municipal building for the City of Washington at some point on the south side of Pennsylvania avenue, between 7th and 15th streets, to be bought at private sale, or by condemnation, if necessary. The total cost of the site and building is limited to \$2,500,000, one-half to be paid by the U. S. Government and one-half by the District of Columbia.

WINNIPEG, MANITOBA.—The Canadian Northern will soon begin work on extensions to double the capacity of the car shops in Winnipeg.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xviii.)

Central Railway Club Election.

At the annual meeting of the Central Railway Club, Jan. 10, the following officers were elected for this year: President, J. R. Petrie; Vice-President, W. H. Marshall; Executive Committee, J. R. Petrie, W. H. Marshall, G. W. West, S. H. Jones, W. H. Rosevear and James Macbeth.

Western Railway Club.

The next meeting of the Western Railway Club will be held Tuesday afternoon, Feb. 18, at the Auditorium Hotel, Chicago. Dr. C. H. Williams, of Boston, will present paper on "Vision, Color Perception and Hearing," and Mr. W. H. Stocks, Master Mechanic of the Chicago, Rock Island & Pacific, will have a paper on "Tests of Locomotive Driver Brake Shoes."

New York Railroad Club.

The next meeting of the Club will be held at 349 Madison avenue, New York, at 8 p. m., of Tuesday, 20th inst. Subject for consideration is: "Best Methods in Shop Practice in Meeting the Requirements for the Maintenance of all Steel Cars; Probable Future Shop Changes Necessary." Several ten-minute papers will be presented and then the subject will be open for general discussion.

Iowa Railway Club.

A brief notice of this new organization, sent to us by a correspondent, was published last week; but we now have a letter from the Secretary, Mr. P. M. Plumb (C. M. & St. P.), Marion, Iowa, which gives additional details and corrects a few errors. The correct name of the club is as shown at the head of this paragraph. The object of the club is "the promotion of fellowship among railroad men and the advancement of knowledge among its members concerning the operation of railways." The clause of the constitution describing qualifications of members is very liberal, taking in not only officers and employees, but "persons engaged in kindred interests," the limits of the last-named class being subject, however, to regulation by a by-law. Meetings are to be held on the third Tuesday of each month; and at each meeting the Executive Committee will announce where the next one is to be held.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. E. Burton, Master Mechanic of the Seaboard Air Line at Fernandina, Fla., was instantly killed Feb. 8.

—Mr. Edward B. Hill, of Brookline, Mass., who for many years was in railroad service, first on the Erie road, then as Manager of the New England Car Service Clearing House, died at his home in Brookline on Feb. 7.

—Mr. A. C. Henry, General Purchasing Agent of the Canadian Pacific Railway, died Feb. 2. He entered the services of this company in 1884 as Assistant Purchasing Agent, later assuming the duties he held at the time of his death.

—Mr. David H. Barger, who has succeeded Mr. Huger as Superintendent of the Second Division of the Seaboard Air Line at Raleigh, was formerly with the Norfolk & Western as Claim Agent. Mr. Barger was born in Blacksburg, Va., Nov. 1, 1857. His railroad career dates from 1876; beginning with the Atlantic, Mississippi & Ohio, now the Norfolk & Western, and remained with that company up to the time of his recent appointment, serving in various positions such as Assistant Trainmaster, Trainmaster and Superintendent. It was in 1897 that he became Claim Agent.

—Mr. Edgar Lacy Swaine, Assistant Division Superintendent of the Southern Pacific, was born in 1857. He was graduated from the New York University in 1897 and entered railroad service the same year as a rodman on the Atchison, Topeka & Santa Fe, and was subsequently to 1881 with the engineering department of the same company. Then for seven years he was in private engineering practice in New Mexico and Colorado, and Division Engineer and Engineer of Tracks for the Silver City, Deming & Pacific. From 1888 to 1890 he was Superintendent of the Second Street Cable Railway at Los Angeles. Mr. Swaine went with the Southern Pacific in 1890, first as Assistant Resident Engineer, then Resident Engineer and on January first this year received his new appointment as above.

—Mr. A. Gordon Jones, who has been in the service of the Southern since 1897, having charge as Superintendent of the following Divisions, the Anniston, Macon, Charleston and Washington, was born at Gordonsville, Va., Jan. 23, 1858. Mr. Jones was educated at St. Johns College, entered railroad service in 1874 and for four years held various positions such as Telegraph Operator, Bill Lading Clerk, Ticket Agent, Car Accountant and Clerk on the Virginia Midland. In 1881 he became Superintendent of Telegraph, later becoming Assistant Division Superintendent of the Mexican Central. For two years (1885-1887) Mr. Jones was Assistant to the General Manager of the Baltimore & Ohio, afterwards becoming Superintendent of the Harper's Ferry & Valley Division. He became identified with the Southern in 1897, taking the position of Assistant Superintendent of the Sixth Division, and was from then until his new appointment, Superintendent of the Washington Division, Superintendent of the Divisions above named.

—Mr. W. A. Nettleton, who recently became Assistant Superintendent of Motive Power & Machinery of the Atchison, Topeka & Santa Fe, was formerly Superintendent of Motive Power & Machinery of the Kansas City, Fort Scott & Memphis. Mr. Nettleton resigned from the last-named position in July last, after the Kansas City, Fort Scott & Memphis was bought by the St. Louis & San Francisco. He is a native of Missouri, having been born at Hannibal in 1863, and was educated at Phillips Andover Academy and Yale University. His railroad career dates from 1885 when he began as a rodman and levelman on the Kansas City, Fort Scott & Memphis. The following year he was a student with the Westinghouse Air Brake Company. He was also at one time a student with the Union Bridge Company at New York. For three years (1889-1892) he was Engineer of Tests of the Kansas City, Fort Scott & Memphis, and in the last-named year became Superintendent of

Terminals of the Kansas City & Memphis Railway & Bridge Company. As will be seen, the greater part of Mr. Nettleton's railroad service has been with the Kansas City, Fort Scott & Memphis before its absorption by the St. Louis & San Francisco.

—Mr. William C. Nixon, the new General Manager of the Gulf, Colorado & Santa Fe, was, previous to taking this position, General Superintendent of this company. Mr. Nixon is 44 years old and entered the service of the Burlington & Missouri River in Nebraska in 1878 as Bridge Carpenter. He remained there nine months, then took service with the Atchison, Topeka & Santa Fe at Emporia Junction, Kan., as a watchman, since which time Mr. Nixon has held various positions. In 1889 he became Superintendent of Terminals at Kansas City and on June 1 the following year was promoted to a Division Superintendent and was subsequently Super-

intendent of Terminals at Chicago and General Agent. In 1897 he was appointed Superintendent of the lines east of the Missouri River, which position he held until his appointment as General Superintendent.

—Mr. Waldo H. Marshall has been appointed General Superintendent of the Lake Shore & Michigan Southern Railway. He was appointed Superintendent of Motive Power of that road in June, 1899, and now is advanced to the office of General Superintendent to succeed Mr. Smith, who goes to the New York Central. For a dozen years Mr. Marshall has been working steadily up, and in recent years has been so conspicuous, especially among the technical men, that it is hardly necessary to tell our readers who he is. He was born June 7, 1864, and had a public school education. He served for some time in the Rhode Island Locomotive Works as a draftsman. He went to Chicago on the editorial staff of the *Railway Review*, and we have always supposed, although possibly incorrectly, that this step was taken through his acquaintance with the late David L. Barnes, who had known Marshall at the Rhode Island Locomotive Works. He was for some time editor of the *Master Mechanic* and also of the *American Engineer*. In May, 1897, he went to the Chicago & North Western as Assistant Superintendent of Motive Power & Machinery. There he remained until June, 1899, when he went to the Lake Shore. The solidity of Mr. Marshall's character and his capacity for acquiring knowledge have given him a quite distinctive place among mechanical officers. In later years he has not had time to write much, but he has been among the active minded members of the technical societies and the railroad clubs, and a frequent contributor to their discussions, and not long ago he prepared an admirable address for the students of Purdue University on recent developments of locomotive practice. We shall be surprised if Mr. Marshall does not prove a real addition to the number of strong administrative officers.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—F. J. Shepard, heretofore Chief Clerk to the Third Vice-President of the Atchison, has been appointed General Superintendent of the "Santa Fe Coast Lines," succeeding A. G. Wells, promoted.

The position of General Master Mechanic, formerly held by Jas. Collinson, has been abolished. D. E. Cain has been appointed Assistant to the General Manager.

Brunswick & Birmingham.—At a meeting of the Directors held recently C. L. Hyde was elected President.

Canadian Northern.—The jurisdiction of A. J. Gorrie, Superintendent at Port Arthur, Ont., has been extended over the entire system.

Canadian Pacific.—E. N. Bender, heretofore Assistant General Purchasing Agent, has been appointed General Purchasing Agent, succeeding A. C. Henry, deceased.

Central Vermont.—E. H. Fitzhugh has been elected Vice-President and General Manager, succeeding R. S. Logan, resigned.

Cincinnati Northern.—W. D. Stearns, heretofore Trainmaster, has been appointed Superintendent of the Michigan Division.

Denver & Rio Grande.—C. H. Quereau, Assistant Superintendent of Machinery, having resigned, the office is abolished. (See Personal column last week, p. 102.) J. C. Hechler has resigned as Roadmaster at Pueblo, Colo. He was for a number of years Roadmaster of the Illinois Central at Chicago.

M. H. Rogers, heretofore Chief Engineer, has been appointed Consulting Engineer, and E. J. Yard, heretofore Chief Engineer of the Rio Grande Western, becomes Chief Engineer of the entire system.

Fort Worth & Rio Grande.—W. B. King, Vice-President and General Superintendent, has resigned.

Great Northern.—The title of J. C. Eden will be Assistant General Traffic Manager, instead of Western Freight Manager as recently stated.

Gulf, Beaumont & Kansas City.—J. S. Hershey has been appointed General Freight and Passenger Agent.

Hearne & Brazos Valley.—H. H. Perry has been appointed General Freight and Passenger Agent and Auditor, with headquarters at Hearne, Texas, succeeding W. Kirlicks, resigned.

Hocking Valley.—We have excellent authority for denying the rumors that M. S. Connors, General Superintendent, has resigned.

Illinois Southern.—E. S. Walker, heretofore Master Mechanic of the Southern Indiana, has been appointed Master Mechanic of the I. S., with headquarters at Sparta, Ill., effective Feb. 5.

Lake Shore & Michigan Southern.—W. H. Marshall, heretofore Superintendent of Motive Power, has been appointed General Superintendent, succeeding A. H.



Smith, resigned to go with the New York Central & Hudson River.

Los Angeles.—C. E. Donmatin has been appointed Superintendent of the Mechanical Department.

Merchants' Despatch Transportation.—J. C. Miller, heretofore Freight Auditor of the Boston & Albany at Boston, Mass., has been appointed Auditor of the M. D. T., with headquarters at New York City.

New York Central & Hudson River.—William Kleefield, Jr., has been appointed Acting Supervisor of Bridges of the Middle Division, with headquarters at Utica, N. Y., succeeding Clifford Lewis, Jr., resigned.

New York, New Haven & Hartford.—H. A. Bishop, Purchasing Agent, with headquarters at New Haven, Conn., has resigned.

Pacific Coast.—H. W. Bassett has been appointed Superintendent of Bridges and Buildings, with headquarters at Seattle, Wash., succeeding H. F. Martin, resigned.

Virginia & Southwestern.—W. E. Allen has been appointed Assistant General Passenger Agent.

Wabash.—F. H. Tristram has been appointed Assistant General Passenger Agent, with headquarters at Pittsburgh, Pa.

Washington County.—H. F. Burpee, heretofore Acting General Freight Agent, has been appointed General Freight and Passenger Agent, with headquarters at Calais, Me.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA & MISSISSIPPI.—Incorporation papers were filed at Montgomery, Ala., Feb. 1, for a railroad to run from Vinegar Bend, Washington County, Ala., 14 miles southwest to Leakesville, Green County, Miss. Vinegar Bend is a station on the Mobile & Ohio, and Leakesville is on the Chickasawha River. The incorporators are N. C. Turner, H. C. Turner and others.

ALABAMA ROADS.—Surveys are reported for a new line from Steel's, Ala., to the ore fields of the Elliott Car & Machine Co., in St. Clair County. It is said that extension is also contemplated to the company's coal fields in Blount County, and to a junction with the Louisville & Nashville, at Village Springs. The address of the Elliott Co. is Gadsden, Ala.

ALASKAN SOUTHERN.—This company was chartered at Guthrie, Okla. T., on Feb. 5, with a capital of \$2,000,000, to build from Burrow's Bay, Alaska, to Laketon, B. C., a distance of 250 miles. The head office is at Danville, Ill., and the incorporators are J. W. Daly, Ketchikan, Alaska; W. D. Ford, Galena, Kan.; W. I. Cook, Danville, Ill., and others.

ALCOLU.—This company has been chartered in South Carolina to build a railroad 40 miles long between Alcolu, Clarendon County, and Sardinia, Midway Township, of the same county, and thence to some point on Lynch's River, in Florence County. About 20 miles of this proposed route are already in operation by D. W. Alderman & Sons, Alcolu. The road is designed to haul lumber, and the incorporators are Robert J. and David W. Alderman and David C. Shaw, of Alcolu. It is said that building will begin at once.

ANNAPOLIS, BALTIMORE & BAYSIDE (ELECTRIC).—This company has been incorporated in Maryland to build an electric railroad designed to carry both passengers and freight through Anne Arundel County, Md., between the points named, making connection with the United Railways of Baltimore. J. F. Williams, W. R. Townsend and others are incorporators.

ATLANTA, KNOXVILLE & NORTHERN.—It is said that an extension is proposed in Georgia from Marietta to Atlanta, approximately 20 miles, which will be funded by part of the proceeds from a recent bond issue.

BALTIMORE & OHIO.—Surveys are reported in West Virginia for an extension to run from Romney, 35 miles southwest to Petersburg, by way of Moorefield.

BALTIMORE, PITTSBURGH & WESTERN.—This company has introduced a bill asking incorporation of the Maryland Legislature for a line to run northwest from Baltimore to a point on the Maryland-Pennsylvania State line between Piney Creek and Emmitsburg, about 50 miles from Baltimore. It is also desired to run southerly from Baltimore to some point on Chesapeake Bay, and to erect terminals, warehouses, etc. The new company may consolidate with any other line except the Baltimore & Ohio or the Pennsylvania. If built, it would reduce the distance between Pittsburgh and Baltimore nearly 100 miles. The incorporators are E. Stanley Gary, H. A. Orrick and W. C. Robinson, of Baltimore; H. A. Cutler, of Washington, and others. The capital stock is \$2,000,000.

BELINGTON & BEAVER CREEK.—An officer writes that specifications are now being prepared with a view to letting further contracts for this new line between Belington, W. Va., and Staunton, W. Va., 120 miles. Eight miles are at present in operation, between Belington and Weaver. Henry E. Weaver is President, and George E. Gay, Chief Engineer.

BLACK & CACHE RIVER.—It is said that this road, now operating as a freight line from Sedgwick, Ark., on the St. Louis & San Francisco, to Gage, 18 miles, will be extended during 1902 from Sedgwick to Paragould, Green County, 30 miles, and from Gage to Newport, 20 miles. J. E. Culver, Kansas City, Mo., is Auditor.

BRUNSWICK & BIRMINGHAM.—Surveys are reported completed between Cuthbert, Ga., and Eufaula, Ala., 23 miles, direct, for further extensions of this line. Twenty miles of track was reported laid in October, and further surveys, on the route between Brunswick, Ga., and Birmingham, Ala. R. C. Machen is President and J. A. McDuffy, General Manager. (Construction Supplement, Oct. 11, 1901.)

BUFFALO, SPRINGFIELD & CATTARAUGUS. (ELECTRIC.)—This company was incorporated in New York, Feb. 8, with authorized capital of \$1,000,000, to build an electric line 38 miles long to run from Cattaraugus to Hamburg, Erie County. The company's office is at Cattaraugus, and the directors are H. L. Moench, 117 Beach street, Boston, Mass.; L. F. Boies, Norwood avenue, Buffalo; S. F. Burger, Cattaraugus, and others.

CALIFORNIA ROADS.—It is said that work is to begin soon on a narrow-gage line, three miles long, at San Vincente, Cal., to reach timber land owned by F. W. Billing and J. Q. Packard.

CANADIAN PACIFIC.—Grading is completed on the

Winnipeg Beach extension, from West Selkirk, to Winnipeg Beach, 26½ miles, as is also the engineering work on bridges, trestles, etc. Track laying will commence about the first of March. J. D. McArthur & Co., Winnipeg, Man., are the contractors. Rails and rolling stock required are on hand. (Official.)

CENTRAL OF NEW JERSEY.—Extensive betterments are reported on the line between Mauch Chunk and White Haven, Pa., 24½ miles, involving a new rock-ballasted roadbed and the elimination of several curves. The tracks at this point were badly washed by recent floods. It is also reported that a tunnel is to be built, near White Haven, in connection with the betterments there.

CHICAGO GREAT WESTERN.—Contract for the masonry work on the Fort Dodge-Omaha extension was let, Jan. 25, to the Bates & Rogers Construction Co., of Chicago, who are now building the substructure of the new bridge across the Des Moines River Valley at Fort Dodge, Iowa. The contract will include the substructures for a number of overhead crossings and small bridges, but there is no important bridge work on the line. Work is to be commenced early in the spring.

It is said that contracts will be let at once for the projected Zumbrota-Rochester line, surveyed last year. This is to run from Zumbrota, Minn., 30 miles southeast to Rochester, without important bridges or tunnels. Right of way has been secured, and the cost is estimated at \$23,000 per mile. Work is to begin as soon as the frost is out of the ground.

CHICAGO, ROCK ISLAND & PACIFIC.—It is reported that the Rock Island has a corps in the field surveying a line from Marengo, a point on the main line in Iowa County, to Rockwell City, a point in Calhoun County, on the Gowrie-Sibley line of the company, which was built two years ago. It is also stated that the Rock Island has acquired the Boone, Rockwell City & Northern, the line between Gowrie and Fraser, and that it will also acquire the branch of the Iowa Central between Marshalltown and Story City, a distance of 30 miles, or else build a line parallel to it. By the acquisition of these two lines the Rock Island will only have to build the sections between Marengo and Marshalltown, and between Story City and Fraser, in all about 75 miles. This line will reduce the distance of shipments originating in Northwestern Iowa and destined for Chicago, 52 miles, compared with the present routing via Des Moines. Beginning at Marengo the present survey passes through the village of Kostza, seven miles northwest, thence skirting the Iowa River it crosses the Muchakinock branch of the North Western five miles south of Belle Plaine; 20 miles northwest it crosses the Milwaukee at the town of Potter. From Potter the survey parallels the North Western main line at a distance of three miles south, into Marshalltown, where it crosses the North Western and turns northwest five miles to Minerva, the junction point of the Story City branch and the main line of the Iowa Central.

CHOCTAW, OKLAHOMA & GULF.—According to newest reports, the proposed extension to Guthrie, Okla. T., will leave the company's line at Holdenville, Ind. T., and run northwest to Chandler, and thence west to Guthrie, with a branch from Chandler to Shawnee, south, on the main line. The total distance of this route would be about 120 miles. Charter for this extension was granted in Oklahoma, on Jan. 25, with capital of \$1,000,000. (Feb. 7, p. 103.)

COALZACOALCOS, YUCATAN & CENTRAL AMERICAN.—This company was incorporated at Dover, Del., Feb. 3, with capital stock of \$1,000,000, to build railroads and maintain steamship lines in Mexico and Central America. The incorporators are J. B. McDonough, P. O. Saunders and Lindsey McCandlish, of Mexico, and others.

FAIRMONT & BUCKHANNON.—Incorporation was made Jan. 28, of a company with the above title to build from Buckannon, W. Va., to Fairmont, 45 miles south, and effect a junction with the Baltimore & Ohio at that point. The line is designed to reach coal lands in the remote districts of Taylor, Barbour and Upshur counties, through which the line will pass. The headquarters of the company are at Parkersburg, W. Va.

FAIR HAVEN & WESTVILLE. (ELECTRIC.)—Contract has been let to C. W. Blakeslee & Co., New Haven, Conn., to build the nine-mile extension of this electric line to Derby, Conn. The work follows the highway, but involves a number of grade changes on the latter, and several bridges. It is expected that grading will be completed by July 1.

FAIRPORT & PHALANX.—Surveys are reported for a new line in Ohio to run between the points named, 40 miles. Two routes are under consideration, one by way of Garrettsville, direct, and the other, which is slightly longer, by way of Parkman. W. Hawley is Chief Engineer.

FORT WAYNE & GOSHEN.—Incorporation was granted this company in Indiana, Jan. 27, with a capital stock of \$120,000, to build from Fort Wayne to Goshen, passing through Allen, Noble, Kosciusko and Elkhart counties. Motive power not yet determined. The distance projected is about 50 miles, northwest from Fort Wayne, and the incorporators are: J. T. Rothwell, Richard Rothwell, James Lynch and others.

ILLINOIS CENTRAL.—Preparations are reported begun at Hammond, La., for the proposed double tracking of the line between Chicago and New Orleans. Surveys are in progress, and it is thought that the work will be done during the coming summer.

JERSEY CITY & NEW YORK.—This company, which proposes to tunnel the North River independently of the Pennsylvania, has purchased from the Trinity Church Corporation two blocks, bounded by Greenwich, Washington, Barrow and Morton streets and by Greenwich, Christopher and Hudson streets, for use as the Manhattan terminal. It is said that the old tunnel, abandoned in 1892, is to be completed.

KENTUCKY LUMBER & VENEER.—Work is reported in progress on this company's line in Kentucky, 17 miles long, to reach timber lands. A further extension of 10 miles is also proposed. H. Wade Beavers is General Manager.

LA GRANDE & COVE ELECTRIC.—Surveys are reported complete for the Oregon Railway & Navigation Company's new electric line between La Grande and Cove, Ore. Two routes have been surveyed, one of which is 15 miles long and the other 13. S. F. Shaw is the engineer in charge.

MASON & OCEANA.—It is said that work is to be taken up on the proposed extension on this new road in Michigan to Grand Rapids. It has been completed for some time between Buttersville and Walkerville, 27 miles, and work on an extension to Hesperia was reported in October. Maps were filed showing the projected route as

far as Newaygo, 18 miles from Hesperia, at that time, Grand Rapids is about 50 miles from Hesperia. The corporate name of the extension will, it is said, be the Grand Rapids, Ludington & Northern.

MILFORD & BEAVER.—This company has been incorporated in Utah to build between the two towns named in Beaver County, a distance of about 42 miles. The road will run from Milford along the Beaver River to Minersville, thence to Adamsville and across to Beaver, extending also five miles beyond, up Beaver canyon. Henry Altman is President and Treasurer, and A. B. Lewis, Vice-President.

MINNESOTA & NORTH WISCONSIN.—This company has given a trust deed for \$200,000 to the Minnesota Loan & Trust Co., to secure a bond issue the proceeds of which will be applied to building a 50-mile extension to St. Louis and Lake counties, Minn. The road is at present reported completed from Scanlon, Carleton County, 35 miles northeast to timber lands in St. Louis County. A. S. Brooks, of Minneapolis, is General Manager.

MISSOURI PACIFIC.—It is stated that a second track is to be built on the St. Louis, Iron Mountain & Southern from Jefferson Barracks to Bismarck, 66 miles. Improvements are also to be made of the grade between Little Rock and Fort Smith, 150 miles, and between Leroy and Deering, on the Missouri Pacific, 81 miles. H. Rohrer is Chief Engineer.

NEVADA MIDLAND.—The Nevada Central, a single track line 90 miles long extending from Battle Mountain to Austin, Nev., and owned by A. P. Stokes, is reported sold, and is to be extended under the name of Nevada Midland from Austin to Tonopah, 112 miles south. Building is to be done by a Construction Co., soon to be incorporated, which already has a franchise and charter. Simon Bamberger, President of the Salt Lake & Ogden, is President of the new Nevada Midland, and J. E. Hulshizer, of the New Jersey Title Guarantee & Trust Co., is Vice-Pres.

NEW ONTARIO CENTRAL.—Application is being made to the Ontario Legislature for incorporation of a line from a point on the Canadian Pacific between Dryden and Eagle River, Ont., to run in a northerly direction to a point near the westerly end of Lac Seul, about 80 miles.

NEW ORLEANS, HOUMA & NORTHWESTERN.—An officer writes that location is now being made of this projected line in Louisiana from New Orleans, via Houma and Gibson to Morgan City, 80 miles. The company was chartered in December, 1900, and the officers are as follows: Joseph A. Humphreys, Lexington, Ky., President; L. H. Jastremski, Vice-President; and J. M. Corbin, Engineer.

NORFOLK & WESTERN.—Surveys are reported for a new line in West Virginia between Williamson and Kenova, by way of the Tug and Sandy Valleys. The present route, by way of Twelve Pole Valley, is 98 miles long, and it is intended that heavy traffic shall be carried on the new line, as grades will be lower and curvature less.

OREGON RAILROAD & NAVIGATION.—Location is reported completed on a line along the Snake River from Lewiston, Idaho, to Riparia, Wash., about 55 miles. Considerable work has also been done on the grade, and work will begin in the early spring again, following the water grade of the Snake Valley, and furnishing an outlet for the Clearwater Valley country. Lines are now in existence from Riparia in a southerly direction to Walla Walla, Wash., and east to Pomeroy, south of the Snake River.

PEARL & LEAF RIVER.—Contract has been let to C. D. Smith & Co., Birmingham, Ala., to build this proposed line from Hattiesburg to Blountsville, Miss., 36 miles.

PENNSYLVANIA.—Work is reported begun on the projected improvements of the Pittsburgh, Virginia & Charleston between Port Perry and Brinton, on the Monongahela River below Pittsburgh, Pa. The changes contemplated include enlarging the tunnel, 600 ft. long, near Perry, to allow two tracks to be run through it; enlargement of the transfer yards at Brinton, etc., and it is estimated that \$1,000,000 will be spent. H. S. Kerbaugh is the contractor.

The New Brunswick, N. J., Board of Aldermen granted this company permission, on Feb. 3, to elevate its tracks through New Brunswick. Work has already begun on the improvements, which include a new station and a large stone arch bridge over the Raritan River, and it is estimated that the total cost of the work will exceed \$1,000,000.

PENOBSCOT CENTRAL.—Announcement is made that the \$250,000 bond issue of this road has been disposed of to Montgomery Rollins & Co., of Boston, and that work is to begin as soon as weather permits on extending the road to its terminus at Charleston, seven miles north of East Corinth, Me., where the line now ends. It is at present built between East Corinth and Bangor, 19 miles. Hon. F. O. Beal is President.

PERE MARQUETTE.—An officer writes in reference to the grade changes which have been in progress at various points on the line during the past year, that work is practically finished at Milford, Plymouth, Northville and Grand Blanc, Mich. Work to the extent of 180,000 cu. yds. of earth will be completed this year at Evart and Sears, an equal amount having been done last year at these points. New work will be undertaken at Flint, Horton and Lansing Siding, all in the State of Michigan. These last three changes are comparatively slight, and none of the work will be offered for contract, as the Pere Marquette is equipped extensively for this kind of work.

PETERBOROUGH RADIAL (ELECTRIC).—Application is to be made to the Ontario Legislature for incorporation of this company, which proposes to build an electric line from Peterborough to Ashburnham, Lakefield, and through the township of Otonabee to Rice Lake, Ont.

PHILADELPHIA & READING.—Contract is reported let to W. H. Dechant, of Reading, Pa., for 17 piers and four abutments for bridges across the Schuylkill River, and for the grading on each side of the river, on the Norristown & Main Line Connecting Branch. Work is to be completed by next summer.

PINE BLUFF & WESTERN.—An officer writes that surveys are in progress for an extension from Sheridan, Ark., to Benton, 22 miles. The line has been in operation for some time between Pine Bluff and Doyleton, 15 miles, and has recently been extended to Sheridan, in Grant County. W. D. Radford, Pine Bluff, Ark., is Chief Engineer and General Superintendent.

REGISTER & GLENVILLE.—Work is reported in progress between Register and Easterling, Ga., 30 miles, and it is said that 10 miles have been completed, with further extensions contemplated.

REPUBLIC & KETTLE RIVER.—An officer writes that this new line in Washington and British Columbia, the Canadian incorporation of which is the Grand Forks & Kettle River, is graded for its entire length from Grand Forks, via Nelson, to Republic, Wash., 42 miles. Track has been laid from Grand Forks to Curlew, 15 miles, and the bridges and trestles will be completed Feb. 15. A branch seven miles long is projected, from Ferguson to Sheridan Camp. A. S. Clute, Grand Forks, B. C., is Superintendent of the Company, known as the Kettle Valley Lines.

ST. LAWRENCE & MEGANTIC.—Permission is being asked of the Quebec Legislature for incorporation of a subsidiary company to build a new railroad along the shore of the St. Lawrence River from Becancour, Que., to a point at or near the head of Lake Megantic, a distance of about 90 miles, in a southeasterly direction.

ST. LOUIS SOUTHWESTERN.—An officer writes that contract for grading the Dallas extension was let, Jan. 20, to the United States Construction Co. The line approximates 12 miles long, and extends from Dallas northward to an intersection with the Fort Worth branch, four miles east of Carrollton, Texas. (Oct. 11, 1901, p. 712.)

SHEDIAC COAST.—An officer writes in reference to this projected line in New Brunswick, which is to run from Shediac, via Shemogue, to Cape Tormentine, 40 miles, that tenders will be asked for the first 20 miles shortly. Judge A. I. Trueman, of St. John, N. B., is President, and the directors are: C. N. Skinner, St. John; A. P. Barnhill, St. John; A. B. Copp, Sackville; E. A. Smith, Shediac; and E. A. Irving, Buctouche.

SOUTH & WESTERN.—The charter of this company, mentioned Jan. 3, p. 14, calls for a line from the North Carolina-Tennessee State boundary, where the Nolachucky River breaks through, in Unicoi County, to a point in Sullivan County on the Virginia-Tennessee State line, with right to extend beyond. The incorporators are S. J. Kirkpatrick, J. H. Bowman and others, of Jonesboro, Tenn.

SOUTHERN PACIFIC.—It is said that bids are to be received at once for grading the Austin & Northwestern extension between Burnett and Lampasas, Texas, a distance of about 50 miles. The lack of water in the section through which the line is to pass constitutes a serious difficulty to the work.

SOUTH CAROLINA ROADS.—An officer writes that nothing beyond securing a charter has as yet been done in regard to the projected line to be built by the Manetta Mills Cotton Co., from Lando, S. C., to Edgemoor, on the Seaboard Air Line, four miles north. The company intends, however, to begin work about the first of April.

TEXAS ROADS.—Negotiations have been opened by Detroit parties for an uncompleted road in Victoria County, Tex., known as the Guadalupe Valley. It is proposed to extend it to the coast and put it in running order. Victoria County borders on a branch of Matagorda Bay.

TEXAS SOUTHERN.—Announcement is made that the line between Winnisboro and Marshall, Texas, is completed. This consists of a route made up of three lines previously owned by the company, each of which is about 16 miles long, with new work to complete the distance, which is about 76 miles. Train service will be inaugurated March 1.

TILSONBURG, LAKE ERIE & PACIFIC.—Application is being made to the Dominion Parliament for authority to extend the line from a point at or near Ingersoll, Ont., through the counties of Oxford, Perth, Waterloo, Wellington, Dufferin, Grey and Simcoe, to a point on the Georgian Bay, about 120 miles distant. (Nov. 22, p. 816.)

TROY TERMINAL.—This company was incorporated in Troy, N. Y., Feb. 3, with a capital of \$200,000, to operate a terminal electric road from the New York Central railroad yards in Adams street, along Front street to the State Dam. It will be operated exclusively for freight. The incorporators are Edward F. Murray, Ex-Gov. Frank S. Black, C. V. Collins, and others. The temporary organization comprises: President, Joseph A. Leggett; Vice-Pres., Edward F. Murray, and Sec. and Treas., Frank S. Davis.

TYRONZA CENTRAL.—This company was incorporated in Arkansas, Feb. 1, by officers of the St. Louis & San Francisco. The lumber line of the Chapman-Dewey Co., in the same locality, has also been purchased. This extends 15 miles north from Tyronza, and it is proposed to build 12 miles additional in Poinsett County. The directors include B. F. Yoakum, B. L. Winchell, and others.

UNION PACIFIC.—Bids were opened in Omaha, Jan. 31, for rebuilding several sections of the road west of Cheyenne, Wyo. It is said that the work is to be done between Evanston and Ogden, Utah, in Echo and Weber canyons.

WOODWARD & QUANAH.—This company was recently chartered at Guthrie, Okla. T., to build from Woodward, Okla. T., to Quanah, Texas, a distance of about 128 miles. The capital stock is \$1,000,000, and it is thought that the Rock Island may be interested.

GENERAL RAILROAD NEWS.

ATLANTIC COAST ELECTRIC.—Former United States Senator James Smith, Jr., has been appointed Receiver, pending foreclosure, by Judge Kirkpatrick, in the United States District Court, Newark, N. J., Feb. 1.

BOSTON & MAINE.—During the past six months, ending Dec. 31, 1901, operating expenses have increased in greater ratio than gross earnings. The latter amounted to \$16,680,393, an increase of \$438,687 from last year, while expenses increased \$459,844, from \$11,186,553, in 1900, to \$12,646,397, in 1901. Hence the net income from operation decreased from \$5,055,152, to \$5,033,995, and the total net income, after adding income from other sources, decreased from \$5,340,968 for the last six months of 1900, to \$5,314,636, for the last six months of 1901.

CHICAGO & NORTH WESTERN.—By purchase of 1,250 shares of the Peoria & Pekin Union from the Peoria & Eastern (C. C. & St. L.) the Chicago & North Western has acquired an eighth interest in this terminal company of Peoria, Ohio, operating between Peoria and Pekin, 10 miles, with important trackage rights and terminals in Peoria.

CINCINNATI NORTHERN.—Jurisdiction of this road, of which possession has recently been obtained, has been assumed by the Cleveland, Cincinnati, Chicago & St. Louis and the Lake Shore & Michigan Southern. The Lake Shore is to operate the Michigan Division and the Big Four the Cincinnati Division, which makes an approximately equal apportionment. The Cincinnati

Northern extends from Franklin Junction, Ohio, to Jackson, Mich., 205 miles, with three miles of spurs additional, and operates 402 miles, including trackage. The operations for the year ending June 30, 1901, resulted in a deficit of \$2,767.

COLUMBUS, LIMA & MILWAUKEE.—Order has been issued to H. G. Baker, Receiver, by the Common Pleas Court of Defiance County, Ohio, that operation of this road must be abandoned after March 1, as the tracks are in such poor condition that it will be unsafe to use them after the frost leaves the ground. The line is in operation between Lima and Defiance, 40 miles, and some grading is completed beyond Defiance.

DES MOINES, IOWA FALLS & NORTHERN.—This company has closed a contract with the Chicago Great Western, by which it will obtain entrance into Des Moines. The contract runs for a period of five years, with the privilege of renewal. It provides for the use of the tracks of the Great Western from Berwick to a junction with the tracks of the Des Moines Union on the east side of the Des Moines River, and the rental is to be determined upon the wheelage basis.

DETROIT UNITED.—Shareholders are requested to deposit their stock with the Guardian Trust Co., of Cleveland, pending sale in connection with the sale of the property to be made by the committee of bankers, at a price to net not less than \$70 per share.

FLORENCE IRON, PHOSPHATE & R. R.—A mortgage has been filed to the American Trust & Savings Bank, Chicago, Trustee, to secure \$300,000 5 per cent. 30-year gold bonds. This is presumably in connection with the purchase of the rights of the Florence Northern, projected through phosphate deposits owned by the Florence Iron, Phosphate & R. R. Co. Peter Arlund, Louisville, is President.

FORT WAYNE & SOUTHWESTERN TRACTION.—At a meeting of the shareholders, Feb. 1, it was voted to increase the capital stock from \$600,000 to \$1,000,000; to apply the present bond issue of \$500,000, and to execute new \$2,000,000 mortgage. The company has about 25 miles of line in operation with more building.

GREAT NORTHERN.—For the seven months ending Jan. 31, 1902, this company shows substantial increases in gross earnings on all its lines except the Montana Central. Gross earnings on the St. Paul, Minneapolis & Manitoba leased lines were \$18,776,191, an increase of \$4,818,914 over the same seven months in 1900-1. The Montana Central showed \$985,733, a decrease of \$267,440, and the Eastern Railway of Manitoba, \$3,333,128, an increase of \$855,363. Total for system \$23,055,054; an increase of \$5,406,837.

ILLINOIS CENTRAL.—The Louisville & Nashville has sold to this company its Cecilia Branch, extending from Louisville, Ky., to Cecilia Junction, 46 miles. The Illinois Central has been operating this branch for a long time, and has had an option on the property for \$1,000,000, which option it has now exercised.

NEW YORK CENTRAL & HUDSON RIVER.—Kean, Van Cortlandt & Co. offer 3,000 shares of guaranteed 3½ per cent. stock of the Syracuse, Geneva & Corning, at 100 and accrued interest. This road is part of the Pennsylvania division of the New York Central.

PENNSYLVANIA.—Speyer & Co., and Kuhn, Loeb & Co. have bought \$10,000,000 Pennsylvania Equipment Trust 3½ per cent. gold certificates, maturing in semi-annual installments until 1911. The certificates are unconditional obligations; \$1,000,000 additional capital stock has also been listed at the New York Stock Exchange, to acquire the outstanding stock of the Pennsylvania & Northwestern.

The Pennsylvania Co. has purchased, for a price approximating \$250,000, all equities of the Cincinnati Northern in the abandoned Deer Creek tunnel and property along Gilbert avenue and Court street, Cincinnati, acquired with a view to the establishment of terminals at that city.

PITTSBURGH, SHAWMUT & NORTHERN.—A majority of the holders of outstanding 5 per cent. bonds have agreed to a plan of reorganization in accordance with which the issue, \$6,000,000, out of \$12,000,000 authorized, is to be exchanged, dollar for dollar, for new 4 per cent. 50-year gold bonds out of an authorized issue of \$15,000,000; interest for two years at the rate of 5 per cent. per annum upon the outstanding 5s to be funded in advance by payment in the new 4s. Interest on the new bonds, that is, will begin to run Aug. 1, 1903, and each of the present bonds, when deposited for exchange, will receive \$1,100 in the new 4s. The new mortgage will cover, in addition to the present lien, the Kersey R. R., 12 miles long, from Paine to the Kersey mines, and also coal lands and mineral rights in Jefferson and Armstrong counties, Pa. The President, in his statement to bondholders, says that the building of proposed connecting links to the road was delayed by the failure, last June, of the firm which was the company's financial agent. It has also been impossible during the past year to obtain more than 60 per cent. of the cars needed to handle the business which would have otherwise been done. The new agreement, between the Railroad Company, the Interior Construction & Improvement Co., and the Central Trust Co., was filed with the latter, dated Feb. 15.

ST. LOUIS SOUTHWESTERN.—Holders of the second mortgage income bond certificates are requested to deposit their certificates with the Mercantile Trust Co., 120 Broadway, New York, until March 10, 1902, upon condition that all deposited certificates may, upon advertised notice, be returned, without charge, at any time before May 31, 1902. If not so returned, the holders of deposit receipts shall have the right to receive new securities, or rights, or both, upon conditions offered by the company, or to sell their certificates for cash at 80 per cent. of their par value, plus accrued interest. Acceptance of the certificates and terms upon which they will be received to rest entirely with the railroad company. It is stated by the company that the purpose of this plan is to finance the purchase of certain branch lines and securities of other companies already acquired or building; to provide for existing equipment obligations, and for betterments, etc.

UNION PACIFIC.—The freight service of this company over the tracks of the Chicago, St. Paul, Minneapolis & Omaha, between Norfolk, Neb., and Sioux City, Iowa, was discontinued Feb. 1. The Union Pacific, it is stated, would be glad to continue the service, but the Omaha line objects for the reason that the grain on the line has been going to Denver instead of to Minneapolis, and consequently the Union Pacific has been getting the long haul.